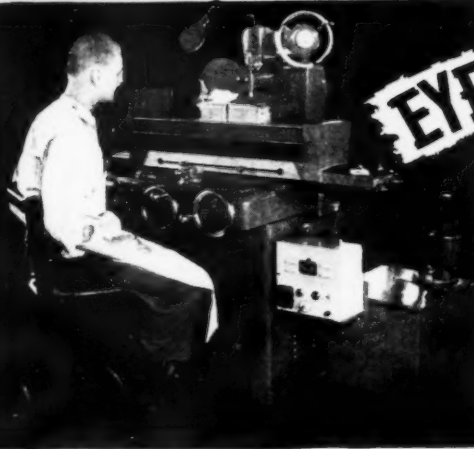


MACHINE TOOL BLUE BOOK

AUGUST 1944



EYE-OPENER

Do ALL

Tool room precision finishes with a production grinder . . . surfaces ground to such close tolerances that you can measure them in micro inches . . . that's what the DoALL offers.

You'll like its quiet, vibrationless performance, its ease of operation. Designed so operator can sit and watch the work at close range without eyestrain or physical discomfort.

And . . . here's the interesting, modern auxiliary equipment available for use with the DoALL.

MAGNETIC CHUCK. Holds work firmly in place with variable amount of magnetic force.

SELECTION. Controls chuck power, demagnetizes chuck, rectifies current, etc.

COOLANT UNIT. Steady flow

of 1 to 30 gallons per minute.

DUST COLLECTOR. Keeps work and table free from dust.

GRINDING WHEELS. Perfectly balanced. Various abrasives and grains. Sizes 7 and 10" diameters.

Send for Illustrated Literature Today.

CONTINENTAL MACHINES, INC.

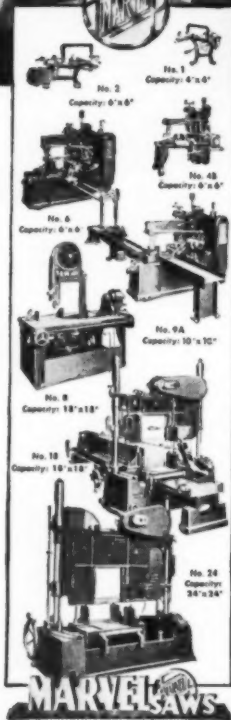
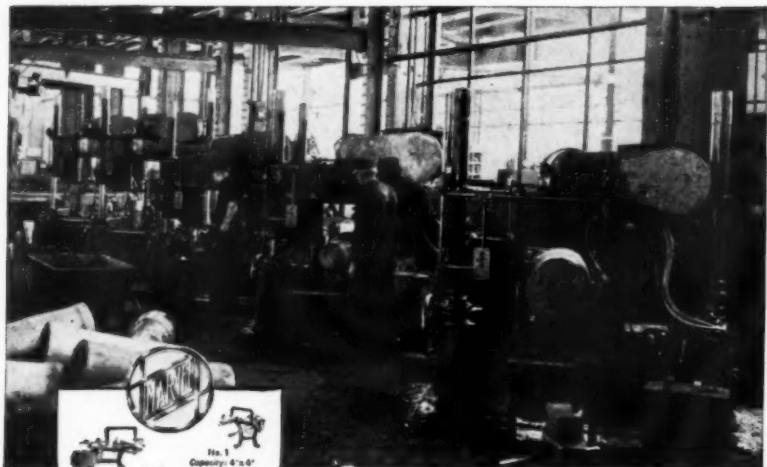
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Surface Finish**

**OVER 600 SQ. IN.
of Bearing Area**

**VIBRATION
Cut to Minimum**

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Hydraulic Drive**

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Hack Saw Method Steps up Locomotive Production

In the large shops of the American Locomotive Co., at Schenectady, wartime production has reached a new peak.

Among the improved methods contributing to this record output, has been the increase in the use of the modern MARVEL Hack Saws for cutting-off even the largest work; for cutting-off car axles, wrist pins and all large forgings—work formerly done with more expensive methods and costlier equipment. One of the first to discover the efficiency and economy of the hack saw method for large work, this company ordered three No. 18 MARVEL Giant Hydraulic Hack Saws soon after these revolutionary Saws were first announced. Today, they are using twenty MARVEL Saws, including eleven of these massive, ruggedly built giant hydraulics.

MARVEL Saws are increasing the production of war materials in all parts of the country by rapidly, accurately and economically cutting-off the toughest steels in cross sections up to 24" x 24". If you have metal sawing problems, call on the local MARVEL Engineer to recommend methods and equipment.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. Bloomingdale Ave., Chicago 39, U.S.A.
Eastern Sales Office: 225 Lafayette St., New York 12, N.Y.



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HOBART before you buy another ARC WELDER.

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ARC WELDERS

REMOTE CONTROL . . . just one of the many reasons that make Hobart the fastest selling Arc Welder on the market today. Operators demand this exclusive feature and the Hobart Multi-Range Dual Control that simplifies use of all types



of welding electrodes for all applications. You can select exactly the right heat instantly with this finger tip control that gives you 1,000 combinations of voltage and amperage . . . without a single dead spot. Compare them all . . . then buy the finest . . . HOBART!

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"One of the World's Largest Builders of Arc Welders"

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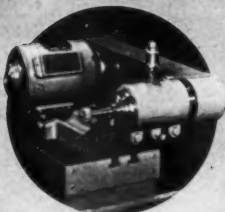
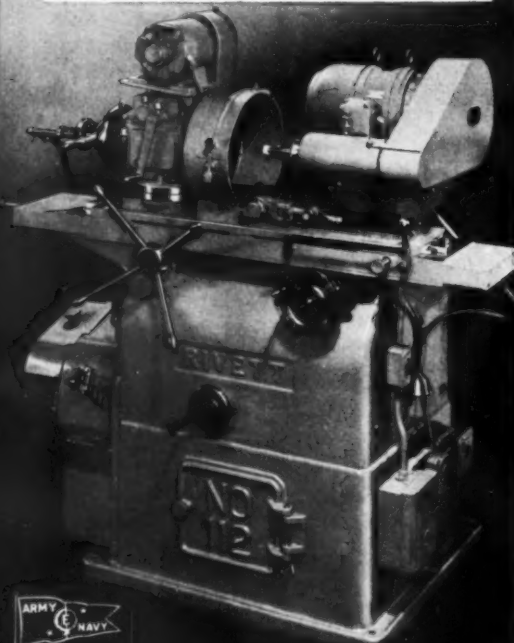
BACK THE ATTACK! BUY HOBART WELDERS!

RIVETT

FOR STRAIGHT, TAPER, BEVEL OR STRAIGHT AND BEVEL GRINDING

The Rivett No. 112 Universal Precision Grinder is primarily for tool-room work. Available internal and external spindles in combination with many adjustments make possible a great variety of grinding operations. Extreme simplicity of design enables any mechanic familiar with grinding to operate the machine.

Work may be held in collet, step chuck, jaw chuck or fixture and driven at required speed. Power table reciprocation may be set at one of eighteen selective speeds, from 10 to 96 passes per minute. Length of table travel is infinitely adjustable between $\frac{1}{4}$ " and 8". High or low speed internal bracket or external spindle bracket, all as illustrated, may interchangeably be mounted as required on cross slide. Workhead, table and cross slide are swivelled individually or in combination for taper and bevel grinding.



High Speed Internal
Spindle



External Spindle
and Tailstock

SPECIFICATIONS

Grinding cap. hole dia.	$\frac{1}{4}$ " to 8"
Grinding cap. outside dia.	up to 8"
Automatic table travel	$\frac{1}{4}$ " to 8"
Table speeds	18 selective
Hand table travel	18"
Swing cross table	14"
Workhead swivel	90°
Table swivel	5°
Cross slide swivel	90°
Cross feed graduations0005"
Travel of cross slide	3 1/4"
Collet capacity	1"
Step chuck capacity	1 1/2"
Jaw chuck capacity	1 1/2"
Workhead spindle speeds	150, 250, 600 r.p.m.
Grinding spindle speeds:	
Standard int.	4800 and 10000 r.p.m.
High speed int.	25000 r.p.m.
External	5000 r.p.m.
Automatic Oil Lubrication	
Net weight with motor	3700 lbs.



For Further Description
Write for Bulletin 112

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS.

HARDINGE

COLLET INDEX FIXTURES



HARDINGE Horizontal-Vertical Collet Index Fixture with Sub-Base and Tailstock for PRODUCTION WORK.

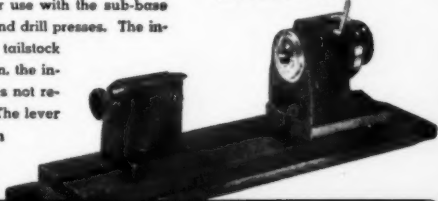
Time and again, you have experienced the need for a fixture to quickly hold work accurately and, at the same time, provide a means for indexing. **HARDINGE** Collet Index Fixtures fulfill those requirements economically and there is planned interchangeability of the various units for application to a wide variety of work.

These fixtures are for direct application or for use with the sub-base on your milling machines, grinders, shapers and drill presses. The index head shown above with sub-base and tailstock can be used in a horizontal or vertical position, the index plate has preselector screws so that holes not required for a particular job can be "blinded". The lever facilitates chucking of work on a production basis.

Ask for complete bulletin.

SPECIFICATIONS: Take standard 1" capacity 5C Hardinge Collets. Available with either a 20 or 24 hole hardened and ground index plate. The sub-base is 24 1/2" x 5 1/8"

HARDINGE Horizontal Collet Index Fixture with Sub-Base and Tailstock for TOOL ROOM and INSPECTION WORK



"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

HARDINGE BROTHERS, Inc.,

ELMIRA, N. Y.

ARMSTRONG

They still don't know the capacity of an ARMSTRONG TOOL HOLDER

War urgency has led to a phenomenal stepping-up of speeds and feeds on lathes, planers, slotters and shapers. Some operations are now being done on the same equipment in half or even less the time which was thought to be "required" in prewar days. Still in no case have they reached the ultimate capacity of their ARMSTRONG TOOL HOLDERS.

So designed that the machine with greatest efficiency, with greatest convenience, maximum clearance, maximum visibility . . . with simple, inexpensive cutter-bits any mechanic can quickly grind from stock shapes of high speed steel, ARMSTRONG TOOL HOLDERS still have strength beyond any need, have capacity beyond that of the machine tools on which they are used.

For more production per man and more pieces per machine, tool completely with ARMSTRONG tool holders. Keep up with war time requirements; be equal to the speeded-up post-war competition.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

308 N. Francisco Ave., Chicago 12, U.S.A.

Eastern Warehouse & Sales Offices:
199 Lafayette St., New York 12, N. Y.



Machine Tool Blue Book

Hitchcock Publishing Co., 542 So. Dearborn St., Chicago 5

Published Monthly

Volume 40, No. 8

AUGUST 1944

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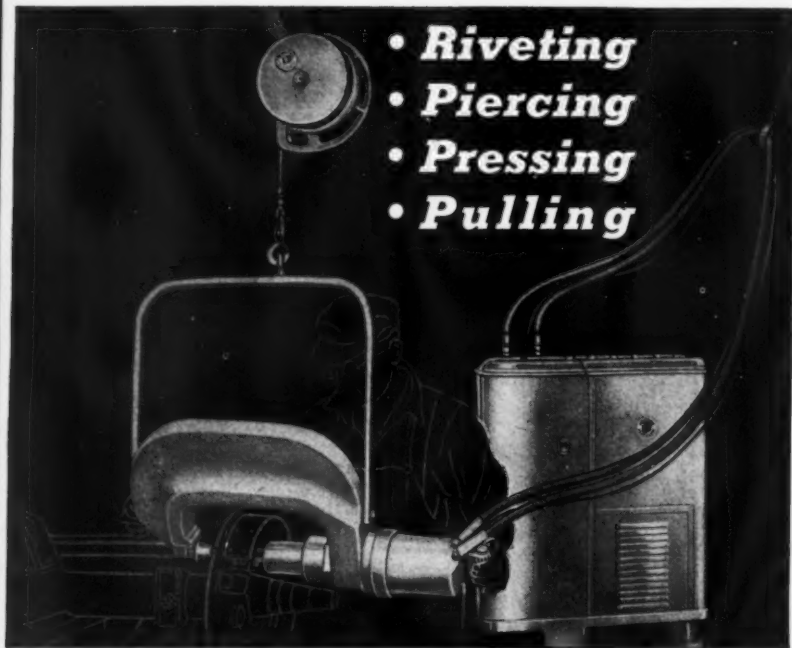
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- **Riveting**
- **Piercing**
- **Pressing**
- **Pulling**



CP HYDRAULIC POWER MACHINE

DEVELOPING pressures up to 100 or more tons, CP Hydraulic Power Machine . . . comprising a self-contained generating plant and a CP Work Unit . . . speeds output and cuts costs in all types of high speed production riveting, piercing, pressing and pulling.

The self-contained CP Power Unit, with an electric motor-driven duplex hydraulic pump, will handle two, three or four CP Work Units operated one at a

time. Or, it will handle any number of Work Units operating simultaneously, up to the capacity of the hydraulic power unit.

Cylinders available in different sizes and capacities can be equipped with a variety of yokes. CP Work Units are light and compact for pressures developed. Suspended by a CP Super Safety Balancer and swivel bail, CP Work Units operate at any angle. Write for complete data on CP Hydraulic Power Machine.

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ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY



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AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES



That's right . . . take a hair, magnify it 62.5 times . . . result — a husky rod. This is just what Jones & Lamson Optical Comparators do to those tiny dimensions that are difficult, or even impossible, to measure by any other means.

If you are a manufacturer of parts that must be right — to a hair — it will pay to investigate Jones & Lamson Comparators. These machines are designed for use in the shop (they don't have to be babied), and they can be used as easily as a mechanic's scale.

Jones & Lamson inspection engineers are at your service to study your particular measurement and inspection problems. Call on them today!

MEASUREMENT AND INSPECTION—BEYOND A SHADOW OF A DOUBT!



This book, "Beyond a Shadow of a Doubt" will be sent to executives asking for it on their firm letterhead.



JONES & LAMSON
MACHINE COMPANY
OPTICAL COMPARATORS Springfield, Vermont, U.S.A.

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

* OFFSET GRINDING

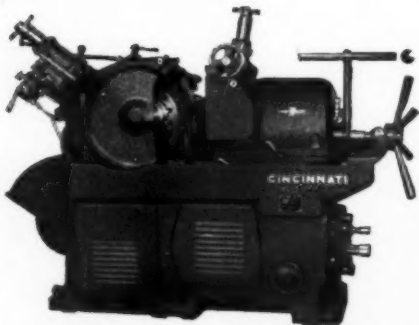
*Offset grinding on a CINCINNATI Centerless Machine means that the grinding wheel merely grinds a narrow section at one end of the part. The greater portion, or the entire length of the part, contacts the regulating wheel to assure adequate driving force.

another type of work

Another example of the many variations in the centerless method of grinding, worked out by the CINCINNATI Application Engineers, is illustrated here.

The operation, known as *offset centerless grinding*, consists of grinding a section at one end of the part by the infeed method. The regulating wheel contacts a different section of the part or, as in this case, its entire length. (see sketch)

The machine is a CINCINNATI No. 2 Centerless Grinder, tooled up with the following equipment: special 8" infeed work rest with hand ejector, spring pressure hold-down roller, two work blades and retracting end stop; hydraulic profile truing for grinding wheel; hydraulic profile truing for regulating wheel. The hold-down roller reacts in two ways (1) it presses the part against the regulating wheel, maintaining contact and increasing



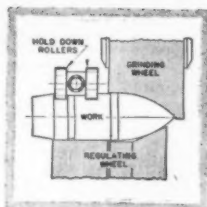
CINCINNATI No. 2 Centerless Grinding Machine. Catalog G-456-1 gives complete details and specifications. Copy will be sent on request. For a brief description of all CINCINNATI Grinding Machines, look in Sweet's Catalog File for Mechanical Industries.

THE CINCINNATI MILLING MACHINE CO.

TOOL ROOM AND MANUFACTURING MILLING MACHINES... SURFACE BROACHING MACHINES... CUTTER SHARPENING

the driving force (2) it prevents any tendency of the part to cock between the wheels because of the grinding pressure being concentrated at one end.

Offset jobs, like many other adaptations of the centerless method, require a thorough knowledge of both centerless and center-type grinding. CINCINNATI Application Engineers have been working out special production problems for many years. Their Centerless "know-how" is at your disposal.

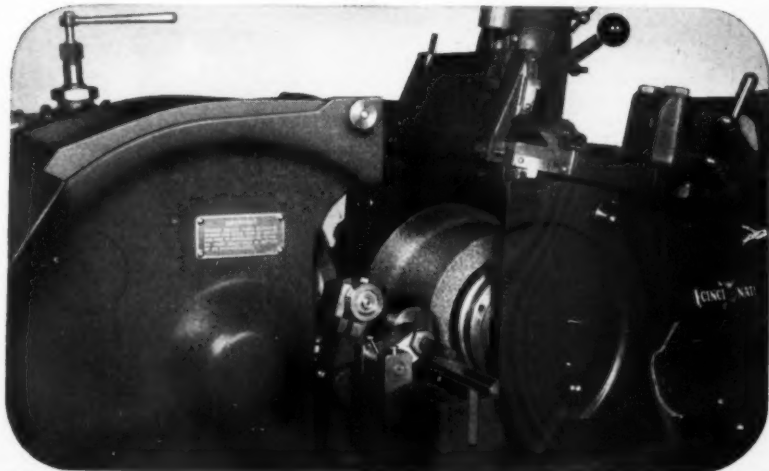


Left—illustration of the basic elements in offset centerless grinding.

for your CINCINNATI CENTERLESS

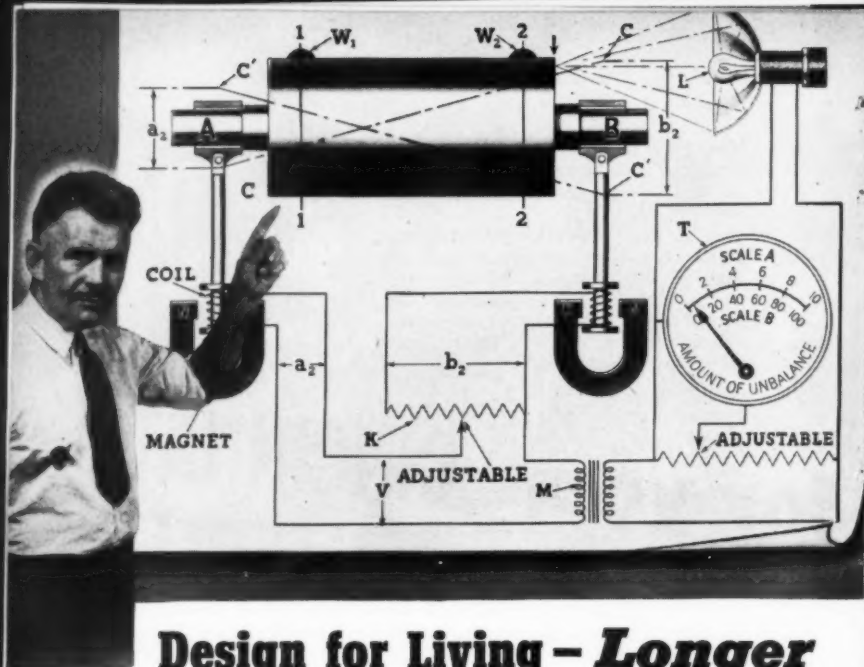


Below—CINCINNATI No. 2 Centerless Grinder with special equipment for offset grinding.



CINCINNATI GRINDERS INCORPORATED CINCINNATI, 9 OHIO, U.S.A.

MACHINES...CENTERTYPE GRINDING MACHINES...CENTERLESS GRINDING MACHINES...CENTERLESS LAPPING MACHINES



Design for Living - Longer

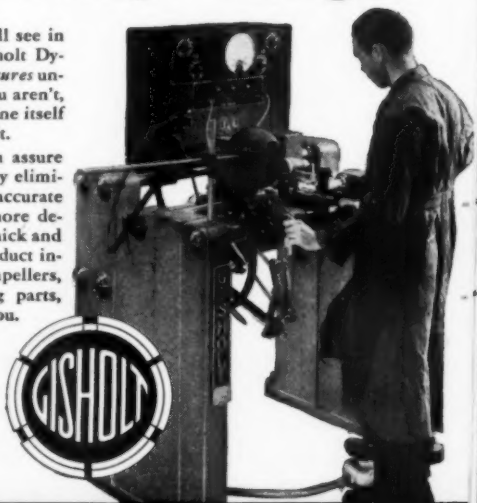
IF YOU'RE an electrical engineer, you'll see in this schematic diagram how the Gisholt Dynetric Balancing Machine *locates and measures* unbalanced forces by electrical means. If you aren't, don't let it bother you. Because the machine itself is so simplified that anyone can operate it.

The important thing is the way it can assure longer life in high speed rotating parts by eliminating vibration. It enables you to make accurate balance a *part of design* for smoother, more dependable operation. And it provides the quick and efficient means of insuring it. If your product involves the use of armatures, crankshafts, impellers, fans, pulleys, other high speed rotating parts, learn how Dynetric Balancing can help you.

GISHOLT MACHINE COMPANY

1185 East Washington Ave.
Madison 3, Wisconsin

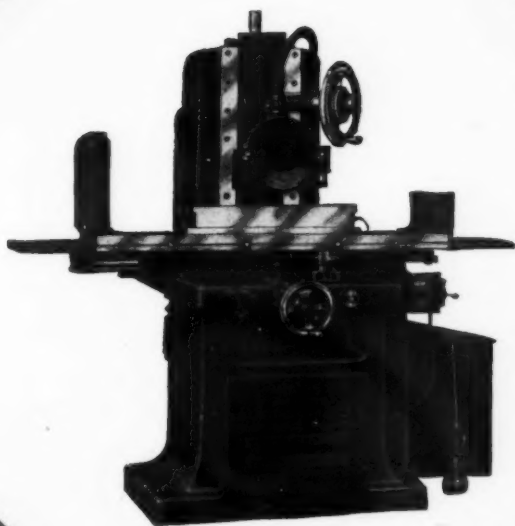
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WITH GISHOLT IMPROVEMENTS



TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

THE GRAND RAPIDS NO. 35 - 8" X 24"

HYDRAULIC FEED SURFACE GRINDERS



FEATURE

Heavy Rugged One Piece Column and Base

Patented Movement of Wheel Head

Bijur One Shot Lubricating System

Two Usable Spindle Speeds

Maximum Longitudinal Table Speed of 115 F.P.M.

Other Sizes from 6" x 18" to 14" x 48" Also Available in This Precision Type Surface Grinder.

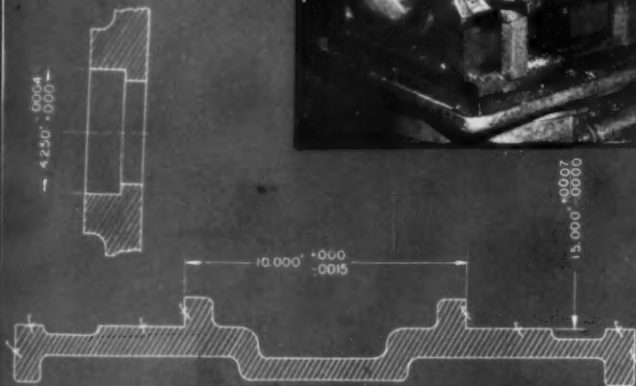
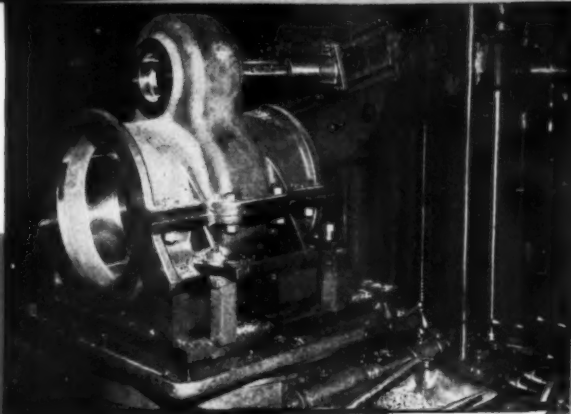
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GALLMEYER & LIVINGSTON CO.

405 STRAIGHT AVE., S. W.

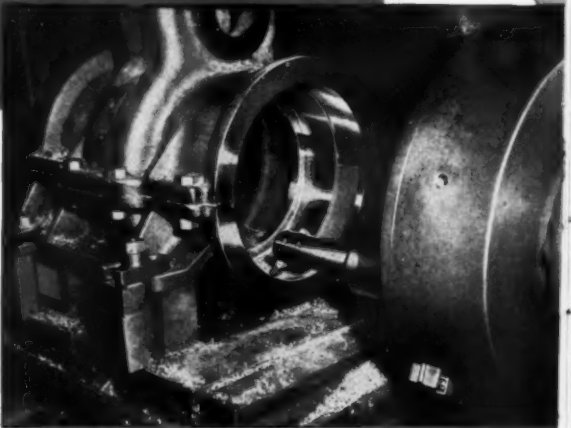
(4) GRAND RAPIDS MICH

(Right) Boring a 4.250" hole in a housing with total allowable tolerance of .0004".



(Above) Sketch of housing showing dimensions and allowable tolerances.

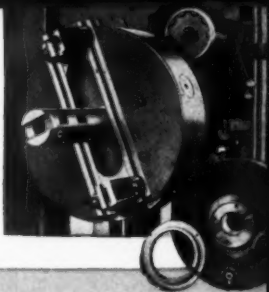
(Right) Continuous Feed Facing Head boring which is mounted on a precision hand indexed rotary table.



GIDDINGS & LEWIS
144 DOTY STREET

Continuous Feed Facing Head . . .

This attachment makes it possible to do facing and boring operations simultaneously. It gives additional flexibility to perform unusual jobs on the horizontal boring machine. Besides having micrometer adjustments, the continuous feed facing head has a tool slide with six separate power feeds.



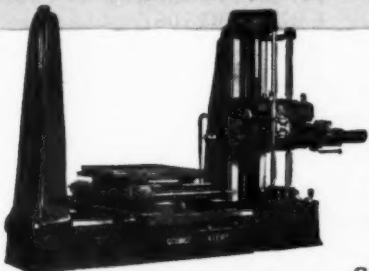
HOW ATTACHMENTS

Increase Versatility AND ELIMINATE SET-UPS

Micrometer Adjustments of Continuous Feed Facing Head, Combined with Precision Indexing of Workpiece on Rotary Table, Enables Working to "Tenths"

Boring operations like these can be performed easily and quickly while holding close limits. In this case the housing is mounted on a precision rotary table and indexed 180° to machine each end individually, using a stub bar and single point tool. The continuous feed facing head is adjusted to size and the saddle feed engaged for boring. On this job total

tolerances of .0007" on 15" bores, .0004" on 4.250" bores and .0015" from face to face of shoulders are maintained. A single set-up, plus indexing, is all that is required. You may have similar work in your own plant. Experienced G. & L. engineers will be glad to advise you how to obtain more production from your machine. There is no obligation for this service.



Machine with built-in Power Rotary Table and Continuous Feed Facing Head mounted in Position . . .

The power rotary table can be indexed to any desired position. This feature makes it possible to reduce the number of set-ups.

Additional Data Available

G. & L. machines and attachments is given in Bulletin No. BB84. Write for your copy today. Kindly indicate business connections.

MACHINE TOOL COMPANY

FOND DU LAC, WIS.



Bodine

LEAD SCREW CONTROL

4-SPINDLE NUT TAPPING MACHINE

The incorporation of several Bodine time-tested principles of multi-spindle design in this No. 48 Nut Tapping Machine permits high speed tapping of Class 3, 4 and 5 gage threads . . . on continuous schedules with the use of unskilled labor.

Fully automatic

The No. 48 is completely automatic, a self-contained unit for tapping any nut blank that can be hopper fed up to $\frac{1}{2}$ "—13 T.P.I., in mild steel or its equivalent.

Two motor-driven, oscillating hoppers deliver blanks through their interchangeable mouthpieces and two adjustable chutes (each) to working plates . . . where the face of the nut is square with the tapping spindle.

Lead screw PRECISION CONTROL

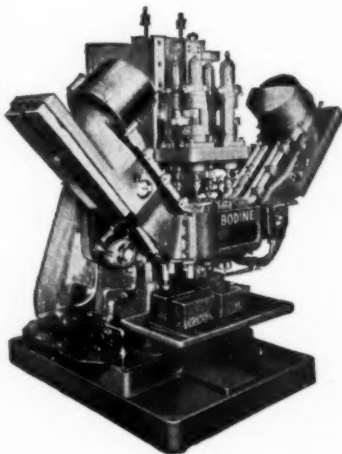
All four spindles are controlled by individual lead screws and operated simultaneously by one segmental gear drive which starts taps at slow speed, then reverses at double the tapping speed. The threads on the master screw and its spring-tensioned nut match those of the tap. Screw and nuts are changed when tap pitch is changed.

Two sizes of nuts simultaneously

If desired, each hopper can carry a different size nut . . . each delivering 2 nuts at each stroke of the spindles. Separate collecting baskets permit frequent gauging of the product of each spindle.

Safety interlocks

No motor can be started except in proper production order . . . nor can the taps operate until blank is in correct position. These electrical interlocks assure safety, protect operator. A vari-speed unit permits instant speed changes by the turn of a handle.



No. 48 . . . FOR CLASS 3, 4 and 5 GAGE THREADS

With the use of the lead screws and their engaging threaded bronze nuts, tapping is to classes 3, 4 and 5 gage fit threads.

If "commercial threads" are to be tapped (Classes 1 and 2) lead control spindles are not required. Bodine will convert spindles to a spring-compensated type.

MAXIMUM PRODUCTION 9000 PER HR.

Production speed is dependent upon tap size, threads per inch, nut thickness, material and cutting speed allowable, coolant used, etc. Maximum speed recommended is 45 strokes per minute . . . which totals 9000 nuts per hour.

Detailed Bulletin On Request





JARVIS ROTARY FILES

TUNGSTEN CARBIDE
GROUND from the SOLID

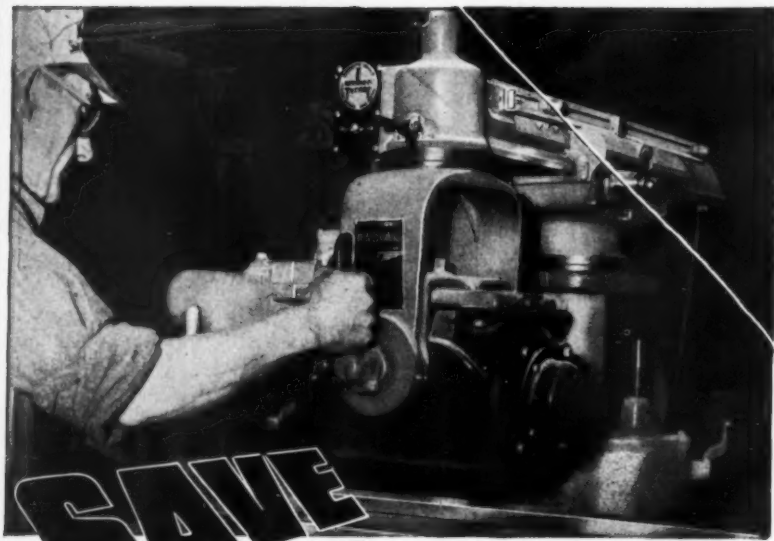
In line with the growing use of Tungsten Carbide tools, the Charles L. Jarvis Company has developed over the past few years a Ground-from-the-Solid Tungsten Carbide file which, from past experience, has proven to be extremely economical wherever standard High Speed Steel Ground-from-the-Solid Rotary Files are used.

It is possible to make extreme claims as to the life and cutting speed of these new type rotary files and experience has proven that if these tools are carefully salvaged for regrinding, the rotary file costs can be cut to a fraction of the High Speed Steel files.

Send For New Catalog

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES
QUICK CHANGE CHUCKS AND COLLETS



SAVE

Time, Labor, Cost WHEN CUTTING LONG OR BULKY WORK!

Workpieces of wide area often cause costly jams in production lines—unless you speed the work on its way with versatile Walker-Turner Metal-Cutting Radial Machines and Band Saws.

These fast, accurate machines relieve overworked, heavier cutting units, and even serve as "first line" production equipment on lighter work. Their wide range of speeds brings practically all materials within their scope. Their simple, easy operation makes every man-hour more productive.

Write today for detailed literature.

WALKER-TURNER CO., INC., PLAINFIELD, N. J.



METAL-CUTTING RADIAL MACHINE

Cutting wide, metal stock is easy with the Walker-Turner Metal-Cutting Radial Machine. Sliding ram design permits transverse travel of 21½". Geared motor—with saw shaft at bottom edge—permits deep cuts with smaller blades than in conventional motors and effects substantial savings in blade costs. Universal head makes mitering and compound mitering, as easy as straight cutting.

METAL-CUTTING BAND SAW

profiling irregular dies, cutting sheets, rods and tubes of steel, iron, aluminum, brass, alloys and compositions—those are a few of the jobs Walker-Turner Metal-Cutting Band Saws are doing quickly, accurately, economically. Available in 14 and 16-inch models, these rugged, compact machines provide a speed range from 61 to 5300 s.f.m.

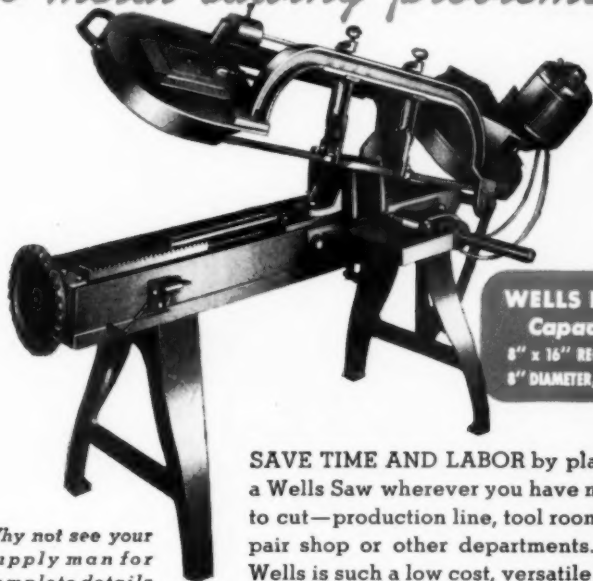


MACHINE TOOLS

DRILL PRESSES • HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

PRODUCTION - TOOL ROOM - MAINTENANCE

*A Simple low-cost answer
to metal sawing problems*



**WELLS No. 8
Capacity**

8" x 16" RECTANGLE
8" DIAMETER, ROUND

*Why not see your
supply man for
complete details
and a demonstra-
tion—it will be
worthwhile.*

SAVE TIME AND LABOR by placing a Wells Saw wherever you have metal to cut—production line, tool room, repair shop or other departments. The Wells is such a low cost, versatile saw, there is no need to tie-up large special production units on odd jobs—or to waste time and labor transporting metal to a saw (the Wells is easy to move to the job).

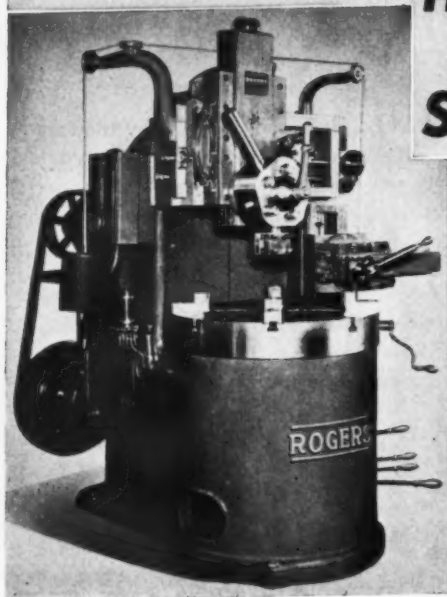


Products by Wells are Practical!

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
707 COOLIDGE AVE., THREE RIVERS, MICHIGAN

ROGERS "Perfect 36" VERTICAL TURRET MILLS



**Have Served
Industry
Since 1885**

**Simplicity of design and
universal adaptability as-
sure—**

**LOW INITIAL COST
LOW OPERATING COSTS
LOW PRODUCTION COSTS**

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neering development can do it
better by writing for complete
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Knowing How Since 1885**

FASTER Tapping **with Less Tap Breakage**

Special design, improved dry-clutch and precision workmanship make Procunier Tapping Machines so sensitive that even unskilled operators can detect an overloaded or dull tap—or determine instantly when tap hits bottom of hole. That means greatly decreased tap breakage. Other features of Procunier design that assure faster, more accurate tapping are: The extra-long spiral compensating springs, with wide range of hand screw adjustments, maintain pre-set tap feeding and reversing pressure **INDEPENDENT OF THE OPERATOR**; Four speeds, ranging from 390 to 2050 RPM efficiently handle jobs for which conventional high speed tapping machines are inadequate. One machine handles tap sizes from No. 2 to ½" through two interchangeable heads.

Tap Establishes Its Own Lead

The new Procunier Universal Tapping Machine is exclusively designed so that it actually allows the tap to establish its own lead. There is nothing more accurate than a precision ground thread tap as a guide for tapping—so maximum tapping efficiency is attained where an accurate tap is free to establish its own lead in cutting the thread.

Send for Special Bulletin

giving full details and prices on the full line of Procunier Universal Tapping Machines, Procunier Precision Tapping Heads and the new Tru-Grip Tap Holder.

PROCUNIER
For Faster, More Accurate Tapping

THE PROCUNIER SAFETY CHUCK CO.,
14 S. Clinton St., Chicago

Send me bulletins on: ☐ Universal Tapping Machines, ☐ High Speed Tapping Heads, ☐ Tru-Grip Tap Holders.

Name

Address

City..... State.....



**MAIL THIS
COUPON TODAY**



What good is a \$10.00 raise ... if it then costs you \$12.00 more to live?

SURE WE ALL want a raise . . . but raises today are bad medicine. And here's why . . .

Suppose you do get a raise . . . and a lot of others get one, too. What happens? The cost of manufacturing goes up. Naturally your boss has to add this increase in cost to the price he asks the retailer. And the retailer, in turn, raises his price to the consumer . . . that's YOU.

So what good is a raise if your living costs go up even faster?

Of course it's hard to give up luxuries . . . and even harder to give up some necessities.

But, for your own sake, for your country's sake . . . start doing these things now . . .

1. Buy only what you need . . .
2. Don't try to profit from the war . . .
3. Pay no more than ceiling prices . . .
4. Pay taxes willingly . . .
5. Pay off your old debts . . .
6. Build up a savings account; buy life insurance . . .
7. Buy and hold War Bonds.

**Use it up . . . Wear it out.
Make it do...Or do without.**



A United States War message prepared by the War Advertising Council; approved by the Office of War Information; and contributed by the Magazine Publishers of America.



WHEN the sensitive hand of a world famous surgeon grasps his scalpel and with a deft stroke, makes an incision, that is when accuracy counts. When the inspector gages a component of a bomber engine, that is when accuracy counts. The very lives of our pilots and air gunners often may depend on the accuracy of the gage.

Woodworth gages are accurate . . . fashioned to astronomically close limits, Woodworth gages are dependable . . . reduce production costs by their long service life . . . Woodworth gages possess "Accuracy You Can Trust."

Write or wire for catalog 44-G today.

ACCURACY YOU  CAN TRUST

WOODWORTH

N. A. Woodworth Co., Sales Division, 1300 E. Nine Mile Road, Detroit 20, Michigan

PRECISION GAGES • GROUND THREAD TAPS • FORM TOOLS • PRECISION MACHINED PARTS • HEAT TREATING • PLATING

Then he said to himself

"A War Measure of First-Class Magnitude"



WHEN the standing of India was occupying the attention of Washington, Mohandas Karamchand Gandhi wrote to the India League of America:

"I want you to look upon the immediate recognition of India's independence as a war measure of first-class magnitude."

For a man so definitely non-Hollywood in dress or words "FIRST-CLASS MAGNITUDE" amounts to a cataclysmic pronouncement.

Again it shows that one who is fired by a great idea automatically adds emphasis to enthusiasm! And *that* is an important business measure.

You saw it well illustrated when war conversion was hurled at manufacturers . . . and when "impossible" schedules were handed them.

Men were far from enthusiastic. Remember?

But viewed in the light of subsequent experience, those quotas for air, land and sea weapons today seem modest. All because aroused men quickly found out first-hand what Arc Welding could do. And when it did the job well, they became enthusiastic . . . which brings triumph to any front.

"A War Measure of First-Class Magnitude"...he says

CONVENTIONAL WELDING



TYPICAL FILLET WELDS

STRENGTH: Stronger than plate
SPEED: 5" per min.
COST: 100%

"FLEET-WELDING"



STRENGTH: Stronger than plate
SPEED: 12" per min.
COST: 42%

LOOK, MAHATMA: While you pondered on the magnitude of political measures for winning, Lincoln Engineers were enthusiastically working out a very practical measure that is away out in front in magnitude:

"FLEET-WELDING"

**A First-Class Production Measure
 ... of First-Class Magnitude**

This new, revolutionary technique using "ARC-FORCE" to speed the welding of all types of joints in plate, shapes and sheet is bringing back reports of 25% to 75% faster welding...also savings in electrode material and power. Cases also are reported where back-chipping and plate beveling are eliminated.

The savings shown at left are typical of this new technique developed by Lincoln engineers.



TYPICAL BUTT WELDS

STRENGTH: Stronger than plate
SPEED: 2" per min.
COST: 100%



STRENGTH: Stronger than plate
SPEED: 9" per min.
COST: 25%



A Lincoln engineer is available nearby to help you apply "Fleet-Welding" Technique. Write for Bulletin No. 440 which gives complete explanation of the simple technique and the welding procedures.

**THE LINCOLN ELECTRIC COMPANY
 CLEVELAND, OHIO**

America's greatest natural recourse
ARC WELDING

★ *There's a Reason*
**WHY MARSHALLTOWN
PRESSES GIVE YOU**

- ★ **BETTER PRODUCTION**
- ★ **LONGER LIFE**

Yes, you can rely on the performance of a Marshalltown Press—they give you the most for your money, because they are engineered and built for dependable trouble-free service. Features include — more die space, chrome molybdenum cranks, wrist pin connections and many other proven advantages.

Write today for literature about Marshalltown Presses — available in capacities from 5 to 70 tons.



NO. 5 FLYWHEEL TYPE

MARSHALLTOWN MFG. CO.
900 E. Nevada Street MARSHALLTOWN, IOWA

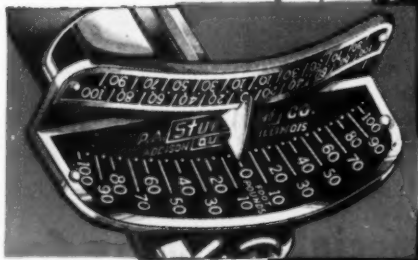
Easy to Read Accurately from any Working Angle

STURTEVANT TORQUE WRENCHES are not only accurate when new, but retain this accuracy permanently. However, much of this inherent accuracy would be useless were it not that the dials on STURTEVANT Wrenches are so designed that they assure accurate readings at all times and from all working angles.

Dials on STURTEVANT Wrenches do not have glass faces to glare, reflect, refract, crack, check, stain or break. The indicator pointer holds its fixed position — the clearly marked calibrations passing laterally below it. The tip of the indicator pointer just clears each raised or sharply depressed mark (you cannot cross-read below it). It is flared

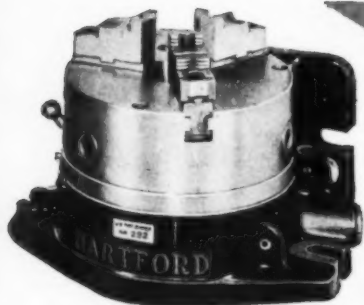
perpendicularly to screen out, adjacent calibrations and prevent mis-reading from side angles. Like the measuring element of STURTEVANT Wrenches, these improved dials are permanently accurate, they require no periodic re-settings.

**BUY MORE
WAR BONDS**



Write for Bulletin TW-15
Showing STURTEVANT
Torque Wrenches in
capacities from 0-40
inch ounces to 7200
inch pounds.

PA **STURTEVANT** CO
ADDISON **QUALITY** ILLINOIS



THE ULTIMATE IN CONTROL
OF MACHINING OPERATIONS

The HARTFORD *Super - Spacer*

Cutting operations generally are out-running handling time, emphasizing the need for improved handling and holding methods.

The Hartford Super-Spacer cuts handling time on indexing operations performed on millers, drillers, planers, slotters, and jig borers. Economical on small or large lots, hence it is a money-saver in tool rooms or on production lines.

Interchangeable mask plates prevent chance of error. Graduations in degrees on the circumference make it easy to obtain odd spacing. Attachments are available for plain and radial drilling.

Let us send bulletin showing Super - Spacer applications on a wide range of unusual jobs.



THE HARTFORD Special Machinery Co.
HARTFORD 5, CONN.

How a Double Duty Tool

Cuts time in HALF

Here was the problem:

3¼" seamless steel tubing to be threaded with a turned section at both ends of the thread—gauge-type, pressure tight thread, with a high degree of concentricity over both turned sections and the thread.

The job formerly required two cuts, with concentricity difficult to attain and there was plenty of scrapped work.

Using a Standard DR 4½" Namco Diehead, with six special combination threading and hollow mill chasers, all the operations were done at one pass.

Both man time and machine time were cut in half. Spoiled work was reduced to practically nothing, and concentricity was maintained automatically.

This is a typical instance of cutting production costs—and improving quality—with Namco Ground Thread Circular Chaser Dieheads.

New Catalog D-42B brings you complete data on Namco Circular Chaser Dieheads, and shows you how to save time and money on long-run precision threading and hollow mill work.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

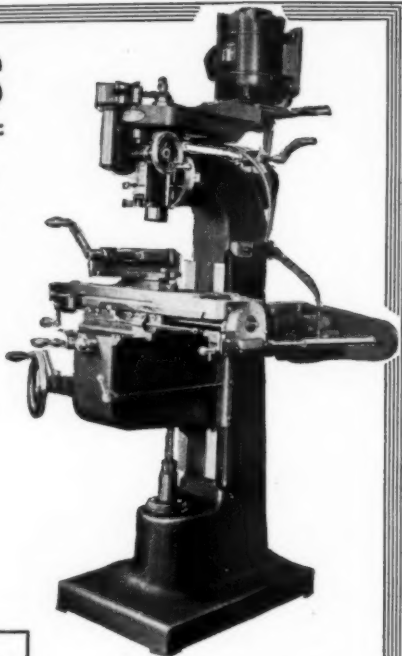
ACME GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLUG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

INDEX MILLS

Now Available With RODS & INDICATORS

WE are pleased to announce a rod and indicator set available for installation on Index Mills, either new at the factory, or used machines already in the field. Set consists of two indicators graduated in .0001", two micrometer heads graduated in .0001", necessary precision rods for locating in an area 8"x16", and troughs for holding rods cross and longitudinal.

This makes it possible for you to obtain, at an astonishingly low price, a precision locator as well as a vertical mill which has already proven its merits in the tool room and production line. Rod and Indicator sets available for other machines also.



Prompt Delivery!

. . . On receipt of order and proper priority certificate.

12" TOOL ROOM ROTARY TABLE

Mfd. by Index Machine & Tool Co.



A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough, 12" size only.

Write to Factory Sales and Distributing Agents for complete information.

BLANK & BUXTON MACHINERY CO.

3100 E. MICHIGAN AVE.
JACKSON, MICHIGAN

No High Inventory Problem

when you use
TECO
Cemented Carbide!



In the face of production changes and cancellations, high tool inventories are a costly and unnecessary risk. TECO Cemented Carbide permits you to keep tool inventories at low levels, while insuring peak production. Here's why:

TECO Cemented Carbide does so much more work, fewer replacements are needed. Its extremely hard, dense, uniform structure provides extraordinary resistance to wear and breakage.

As a result, it produces more pieces between grinds and stays on the job longer than any other cutting material.

Let these advantages of TECO Cemented Carbide help your war production today—and your postwar profits tomorrow. Have one of our tool engineers discuss your needs. Write for catalog and new price list covering grades, sizes and styles for practically all machining needs.



TUNGSTEN ELECTRIC CORPORATION 565 39th Street, Union City, N. J.

Branch Office: 2906 Euclid Avenue, Cleveland, Ohio

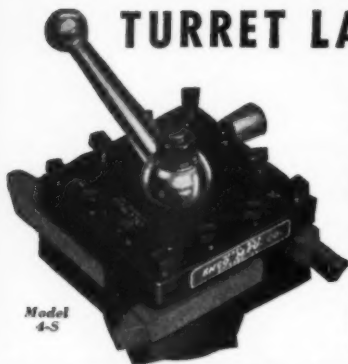
Representatives: Indianapolis, Ind. • Chicago, Ill. • Detroit, Mich.

TECO

Pioneers in Tungsten Carbides
for over a Quarter Century



CEMENTED CARBIDE



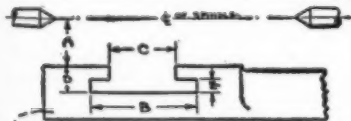
Model
4-S

TURRET LATHE OPERATIONS

on Engine and Bench Lathes with ENCO Turret Tool Posts

Turning, facing, boring, cut-off, threading and forming tools may be mounted in the turret block of your ENCO Turret Tool Post to speed production on your present engine or bench lathe. Fast action, positive indexing brings the next tool into position. Complete job can be set up at once saving valuable lost-time on second operation set-ups. Turret keeps setting accurately. All models mount standard rectangular or square bits as well as standard cut-off blades and boring bars.

"A" Dimension range (from diagram on this page)	Model 6-S	Model 4-S	Model 3½-S	Model 2½-S	Model H
Lathe Swing	2" — 3-1/8"	1-9/16" — 2-1/2"	1-1/8" — 1-3/4"	7/8" — 1-5/16"	7/8" — 1-5/16"
Maximum tool bit size	16" swing & up 1" or 1-1/4"	13" to 16" swing 3/4" or 5/8"	10" to 13" swing 1/2" Sq.	Bench Lathe 3/8" Sq.	Bench Lathe 3/8" Sq.
SPECIFICATIONS	1-3/8" toolholder for 3/8" bit (Where no tool bit size is specified, tur- ret will be furnished for 1 inch tool bit)	(Where no tool bit size is specified, tur- ret will be furnished for 5-8 inch tool bit)			
	4 tool 12 position 6" square Packed in carton Shipping Weight 35 pounds Price . \$99.00	4 tool 12 position 4" square Packed in carton Shipping Weight 12 pounds Price . \$49.50	4 tool 12 position 3-1/2" square Packed in carton Shipping Weight 8 pounds Price . \$35.00	4 tool 12 position 2-1/2" square Packed in carton Shipping Weight 4 pounds Price . \$23.00	6 tool 12 position 3" Hex Packed in carton Shipping Weight 4 pounds Price . \$25.00



Make of Lathe and Size	A	B	C	D	E	Maximum tool size desired

One-week delivery on ENCO Turret Tool Posts made to specifications. When ordering, furnish all required dimensions and tool size desired and name and address of regular dealer.

- 12 position indexing
- 3 positions for each tool
- Carburized hardened steel construction
- Mounts rigidly in compound T-slot
- Keeps setting accurately
- Indexing is self-contained. Eliminates all chip interference

IMMEDIATE DELIVERY

on Turrets for these lathes:
Atlas • South Bend • Logan
Sheldon • Clausing

Also all models with machinable base on
center post for quick adaption to your
lathe.

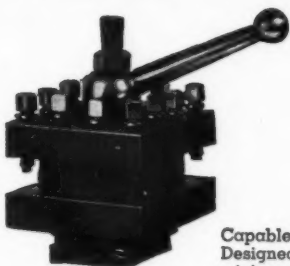
Better dealers everywhere carry complete stocks of Enco Turret Tool Posts and Enco Tailstock Turrets. However, if your dealer does not carry them, send your order and specifications direct to the Chicago or New York offices listed below, supplying name of regular dealer through whom orders can be billed.

ENCO MANUFACTURING COMPANY, Dept. 16

General Office and Factory:
3321-23 MONTROSE AVE., CHICAGO 18, ILL.

Eastern Sales Office: (Complete stocks carried)
118 E. 28th ST., NEW YORK 16, N. Y.

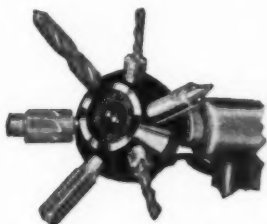
ENCO Heavy Duty



SPECIFICATIONS	HD-1	HD-2
Size of turret block	4-1/2" Sq. 3" thick	6-1/2" Sq. 4-1/4" thick
Range of tool slot height	1" or 1-1/4"	1-1/4" to 1-3/4"
Tool Size Range	3/4"—1"	1"—1-1/2"
"A" Dimension Range	2"—3-1/4"	3"—4-1/2"
Maximum "C" Dimension	2-3/4"	4"
Price	\$99.00	\$130.00
Shipping Weight	20 lbs.	60 lbs.

Capable of taking the strain of hogging cuts under high speed. Designed to mount maximum tool bits. Tool overhang is cut to minimum in these heavy duty models by the tools being mounted directly over the base of the turret. This increases the tool rigidity, permitting a heavier cut which reduces lathe time. 12-position tool indexing adds versatility to the rugged design of this accurate, cost-saving tool.

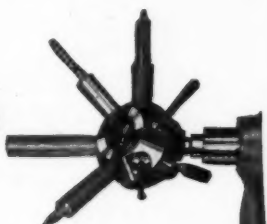
Models HD-1 and HD-2 can be shipped from stock with semi-soft base which can quickly be adapted to your lathe. Two weeks required for turrets fitted from specifications. When ordering turrets to specifications please furnish all dimensions shown on the lathe specification chart. Be sure to specify maximum tool to be used.



Model B

5" in diameter with 6 bored tool holes.
Fitted with No. 2 arbor furnished with 7/8" or 1" tool holes.
Fitted with No. 3 arbor furnished with 7/8" or 1" tool holes.
Fitted with No. 4 arbor furnished with 1" tool holes.
7/8" tool holes are standard on Model B with No. 2 or No. 3 arbor unless otherwise specified.
Packed in carton. Shipping weight 12 lbs.

PRICE \$32.95



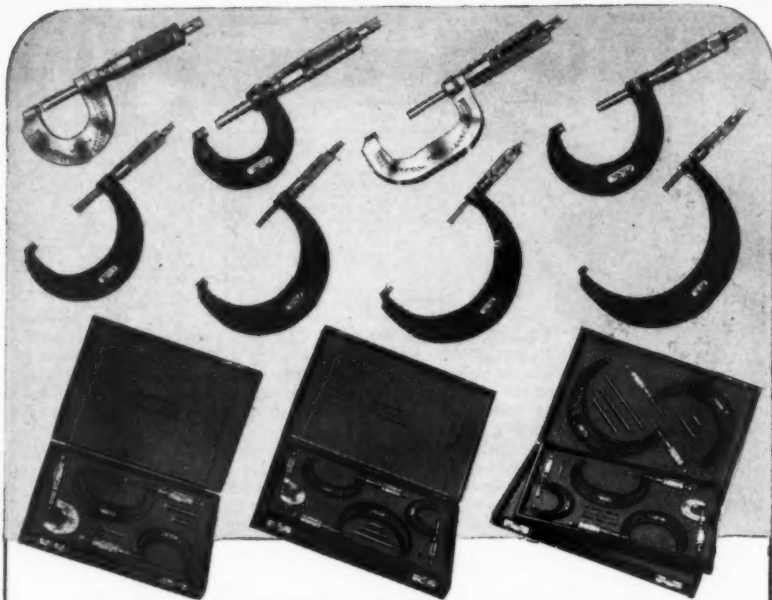
Model A

2 1/2" in diameter with 6 bored 5/8" tool holes. Fitted with No. 1 Morse Taper arbor or fitted with No. 2 Morse Taper arbor (No. 2 Morse Taper arbor furnished unless otherwise specified.) Packed in carton. Shipping weight 3 lbs.

PRICE \$18.95

ENCO Tailstock Turrets are carefully manufactured with all parts fitted within close tolerances. Each turret must pass several thorough inspections with the final inspection for concentricity of tool holes. Because the tool holes are bored after the turrets are assembled, ENCO Turrets are naturally very accurate. Their dependability is indicated by a substantial volume of repeat orders from users. Many shops begin with one ENCO Tailstock Turret to set up tools for a particular job. As other jobs come up, additional turrets are purchased and set up in the same way. ENCO Turrets are as easily set up in your lathe as a center.

**Save Set-Up Time
by Using Them as
Special Chucks for
Each Job**



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CENTRAL *Certified Accuracy* MICROMETERS

WRITE FOR CATALOG NO. 14

The entire line of individual Micrometers and complete sets illustrated and fully described. Write to The Central Tool Co., Auburn, R. I.

All frames forged of the finest special alloy steel • The new improved polished frame Micrometers available in 1" and 2" sizes • The new black enamel finish Micrometers available in all sizes from 1" to 6" • Also available with ratchet stop, lock nut and 10,000ths graduations and a full range of Metric Micrometers in addition to complete sets

Send For Illustrated Catalog Today!

•IMMEDIATE DELIVERY!

THE CENTRAL TOOL CO.

Micrometers of Certified Accuracy

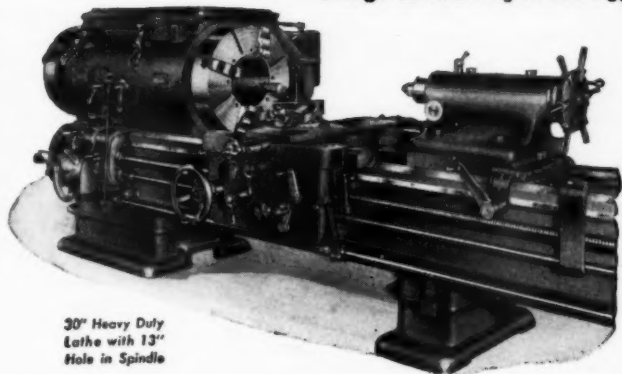
AUBURN . . . RHODE ISLAND





*I Can Sure Do a
BETTER JOB on a
Hydratrol Lathe!*

Large Hollow Spindle Type



30" Heavy Duty
Lathe with 13"
Hole in Spindle

Hydratrol Lathes

LARGE HOLLOW SPINDLE TYPE

IN hundreds of plants—under all sorts of conditions—HYDRATROL LATHES (Large Hollow Spindle Type), are doing a better job than had ever been done before. Invariably they are increasing production, improving work, cutting costs.

The chances are that YOU can "do it better" on a HYDRATROL LATHE. Why not send us prints of your difficult, unusual or too-costly

machining jobs, for a specific, time-and-money-saving recommendation.

Complete Line of Sizes from 18" to 36"

Small	18" up to 7 1/4" Hole
Medium	24" up to 12" Hole
Large	27" up to 13" Hole
Large	30" up to 14" Hole
Large	36" up to 16 1/2" Hole

(Standard Type lathes, 16" to 36")

***L*ehmann MACHINE COMPANY**

CHOUTEAU AT GRAND • SAINT LOUIS, (3) MISSOURI



DAKE takes over

IMPORTANT ANNOUNCEMENT!

Manufacturing and sales rights to Atlas Arbor Presses have been purchased outright by The Dake Engine Company. Atlas Presses, which have enjoyed world-wide acceptance for more than a quarter of a century, will be made by Dake to the same high standards of workmanship and performance as in the past. However, to avoid confusion, these presses will now be known as Dake Arbor Presses.

Dake Presses are available in the full range of Atlas models in capacities from one to seventy tons ... all incorporating the original Atlas Square Ram that features larger bearing surfaces, reduces friction, and prolongs the life of the press.

All inquiries and orders for equipment listed in old Atlas Arbor Press catalogs, directories, or advertisements should now be addressed to The Dake Engine Company of Grand Haven, Michigan.

Send all inquiries to DAKE

DAKE

THE DAKE ENGINE COMPANY

Atlas Arbor Presses



SIMPLE LEVER PRESSES — 8 MODELS — 1 to 5 TONS

Five models of quick acting presses from 1 to 2 tons. Three larger models up to 5 tons, operated by ratchet device for adjusting lever to most convenient position.

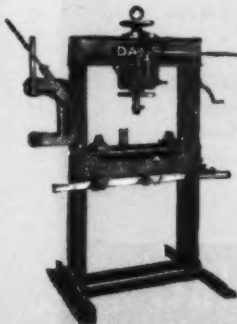
COMPOUND LEVER PRESSES — 6 to 25 TONS

Seven models adjustable quickly to simple or compound leverage with a sliding pin. Handwheel advances ram to work—spindle brake sets ram in any position. Available in bench and floor types.



HYDRAULIC PRESSES 50 to 70 TONS

This 50-ton hydraulic press is equipped with extras not furnished as standard. These presses are rugged, powerful, easy to handle. Two sizes handle work up to 33 and 44 in. diameters.



MISCELLANEOUS PRESSES

Wheel Operated Production Presses
Double Column Presses
Straightening Presses
Portable General Purpose Presses
Hydraulic Work Heads

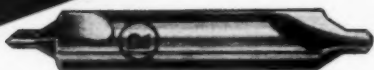
GRAND HAVEN, MICHIGAN

DAKE



COUNTERSINKING CRANKSHAFTS

CIRCLE-R COMBINATION CENTER
DRILLS WERE "Made to Order"
For This Operation



These drills are coping with one of the toughest crankshaft production jobs in the automotive industry. In this capacity a smaller size combined drill and countersink is used for spotting, followed up with a larger size drill.



CIRCLE-R CENTER REAMERS are helping to boost production in the airplane industry where they are used for countersinking of rivet holes. Circular Tool furnishes the majority of reamers used for this purpose.

Send today for Circular Catalog — K



CIRCULAR TOOL CO., Inc.



PROVIDENCE 5, R. I.

CHICAGO • PHILADELPHIA • NEW YORK • DAYTON • CLEVELAND

LOS ANGELES • ROCHESTER • INDIANAPOLIS • DETROIT • ST. LOUIS

MO-MAX

TRADE MARK REG. U.S. PAT. OFF.

HIGH SPEED STEEL

HAS WHAT TOOLMAKERS AND USERS WANT

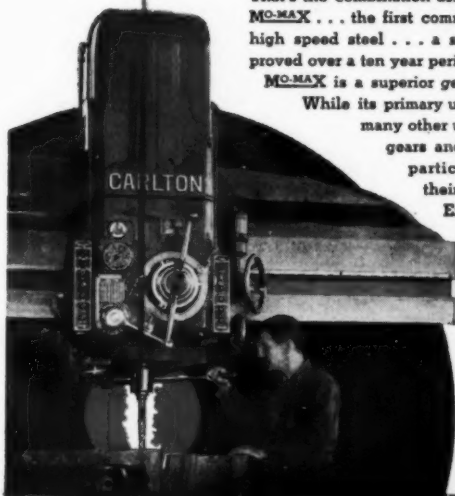
Whether you make metal-cutting tools or buy them for use in your plant, keep in mind that **MO-MAX** offers the properties you want—great toughness plus a high degree of hardness. That's the combination assured by the basic composition of **MO-MAX** . . . the first commercially successful molybdenum high speed steel . . . a steel which has been tested and proved over a ten year period.

MO-MAX is a superior *general purpose* high speed steel.

While its primary use is for cutting tools, it also has many other uses. It can be used for high duty gears and for wearing parts of machines, particularly those which must keep their hardness at high temperatures.

Experienced engineers and metallurgists agree that if a part can be made of high speed steel, it will be *better* if made of **MO-MAX**.

If you make tools, ask any one of the prominent steel producers listed below about **MO-MAX** stocks available today. If you buy tools, remember the brands listed.



THEY'RE ALL MO-MAX

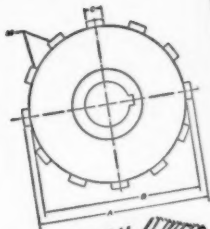
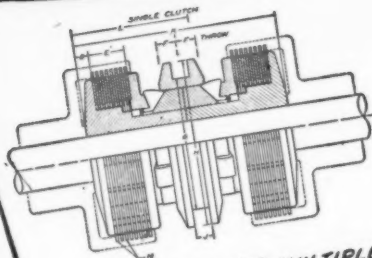
"LHW" Allegheny Ludlum Steel Corp.
 "Moklan" Atlas Steel, Ltd.
 "Forthlehem IDC" Bethlehem Steel Company
 "Mo-Cut" Crucible Alloy Steel Corp.
 "Star Max" The Carpenter Steel Co.

"Mette 8" Columbia Tool Steel Company
 "See-T-Me" Crucible Steel Co. of America
 "Di-Mol" Henry Heister & Sons, Inc.
 "See-T-Me" Halcumb Steel Co.
 "Megul" Ingersoll Steel Company

"Talmo" Lathrop Electric Steel Co.
 "S. T. M." Simonds Saw and Steel Co.
 "Mo-Tung" Universal-Cyclops Steel Corp.
 "B.H.T." Vanadium-Alloys Steel Co.
 "Vul-Mo" Vulcan Crucible Steel Co.

5946

A **HANSON** TRIUMPH... THE MULTIPLE DISC FRICTION **CLUTCH**



HANSON TYPE "F" MULTIPLE DISC CLUTCH



Catalog
FREE on Request

HANSON Engineers Are Ready To Help You . . .

If you have a clutch problem, in the Hanson line you will find just the clutch to take care of it, and our engineers are ready and willing to help you.

The multiple disc type "F" clutches were designed primarily to meet the demands for high quality, compact clutches of great horse power capacities for the available installation space.

Hanson clutches are fully covered by patents and operate at high speeds without any effect from centrifugal force due to perfect balance.

Why not write us today for complete catalog; or better still, tell us your problem.

The Hanson Clutch and Machinery Co.
BOX H-44
TIFFIN, OHIO

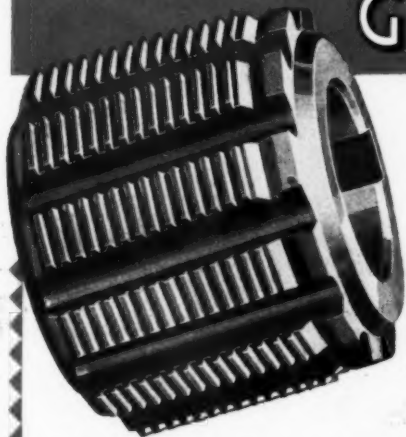
HANSON *Friction Clutches*

for every clutch requirement, regardless of load or drive speed.



SPECIALISTS IN

THREAD GRINDING



With an engineering staff experienced in solving thread grinding production problems, and a large quantity of the most versatile grinders, we are able to satisfy the most exacting requirements. Your prints will receive prompt attention and our quotation and delivery will prove most satisfactory.

- **Multiple Thread Mills**
Any size to 8x12
- **Thread Gages**
Any size to 6" plug, 5" ring
- **Hobs**
Any size to 8x12
- **Production**
Any size to 3" thread length, 6" O.D.



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**DIES • FIXTURES • GAGES
FORM TOOLS • REAMERS • CUTTERS**

HOW TO MAKE SHORT WORK OF PARTS MARKING JOBS



Here's an outstanding time and money saving tool for your parts numbering operations—the Mercury Interchangeable Type Holder. It provides for fast, accurate and fully legible numbering of metal parts, eliminating errors, rejects and the time normally consumed in using single-character dies.

HERE'S ALL YOU DO:

Unlike ordinary one-character dies, which must be used separately, the Mercury holds the entire part number—up to 16 digits, if needed. You simply "load" the tool with the correct part number and snap the cover shut. Thereafter, as many duplicate parts as desired can be quickly and neatly stamped with just a single blow of the hammer for each part! Time normally lost using a separate die for each separate digit is saved, and overlapping, wrong sequence and illegible numbering are eliminated.

The Mercury Type Holder has many more outstanding features you should know about. Type is quickly interchangeable for different part numbers . . . compactness aids in stamping smaller parts . . . all-steel machined construction insures long life, cuts replacement needs. Hardened and ground hand-cut steel type is available in a full range of sizes. Full details, including ordering data and specifications for both hand and press style holders, are contained in descriptive bulletin mailed free on request. Write for your copy today—ask for Mercury Bulletin 1-B



Immediate Delivery!

MERCURY METAL DIE AND LETTER CO.

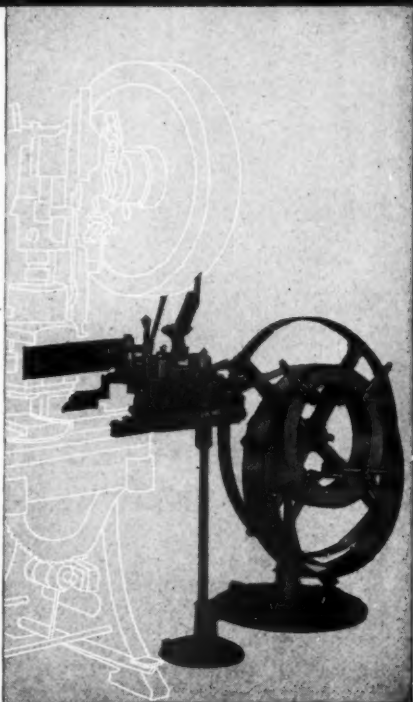
546 EAST 16TH STREET, LOS ANGELES 15, CALIFORNIA



**Our Punch Presses Are More
Flexible And Productive
With WITTEK Automatic
Roll Feeds And Reel Stands**

Manufacturers of metal stampings facing problems in the feeding of coiled strip stock to punch presses will find that Wittek Automatic Roll Feeds and Reel Stands conserve man-hours and achieve new high production levels.

Providing an improved and simplified method of punch press operation, Wittek Automatic Roll Feeds and Reel Stands insure rapid, safe and accurate feeding under all conditions. Made in four different types to meet all automatic feeding requirements. Write for complete details. Wittek Manufacturing Co., 4305-15 West 24th Place, Chicago, Ill.



WITTEK



Automatic

ROLL FEEDS and REEL STANDS

For All Makes and Sizes of Punch Presses

PART NUMBERS

LETTERING

GRADUATIONS

ROLLED

BY MACHINE

ON

FLAT & ROUND SURFACES

Sure - Fast - Accurate

OBSOLETES HAND STAMPING

SAVES { PARTS
LABOR
STAMPS

Eliminates POOR MARKING
ERROR — NOISE

Speeds . . DELIVERIES

ALSO ADAPTED TO CERTAIN KNURLING OPERATIONS

This Hydraulic Machine will mark piece parts quickly and accurately. It is serving in the war effort in many plants for marking components of guns, tanks, planes, motors, engines, shells, and practically every metal part produced for war equipment. Machine will mark unlimited number of sizes and shapes when equipped with proper tools and fixtures. It will also do an excellent knurling job on solids and shells of small diameters.

Designed and Built By

GEO. T. SCHMIDT, INC.

1802 BELLE PLAINE AVENUE CHICAGO 13, ILLINOIS



MODEL 175

**FOR FINER
FASTER FINISHING**

Use **DREMEL** Moto-Tools

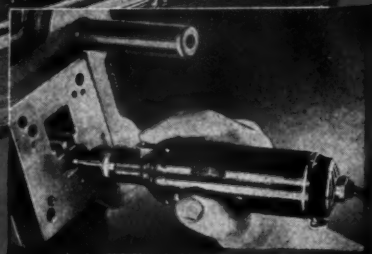
Model 2 Moto-Tool, complete with accessories, as illustrated, in felt-lined hardwood case — \$23.50. Model 2 Moto-Tool only, with emery wheel point — \$16.50.

**27,000
R.P.M.**

Used in machine shops and tool rooms for finishing intricate dies. Used on production lines to clean castings, turnings and forgings . . . sharpen tools and do hundreds of grinding, finishing, polishing, burring, routing and etching operations.

Dremel Moto-Tool has AC-DC motor with shock-proof ball-belt housing, oil-sealed (oil-less) bearings, and built-in cooling fan. Weighs only 13 ounces — so light and compact a girl can handle it with ease. Dynamically balanced armature eliminates vibration and provides precision control. Moto-Tool's high speed (27,000 rpm) permits finer, faster work—conserves cutters.

Dremel Moto-Tools are proving indispensable aids in speeding up war production in such plants as General Electric, Westinghouse, Remington Arms,



Ford, Nash-Kelvinator, Consolidated Aircraft, Douglas and Northrup Aircraft, and many other "Aircrafts."

Try a Dremel Moto-Tool on your own job—in your own shop. See how versatile, how indispensable it is — how it saves time and materials. Order from your distributor or contact a Dremel Representative. **PROMPT SHIPMENT** on orders with proper priority.

Federated Sales, 2437 W. Valley, Alhambra, Calif.

EMI Factor Products, 53 W. Broadway
New York, N. Y.

F. W. Fowler, 187 Federal, Boston 10, Mass.

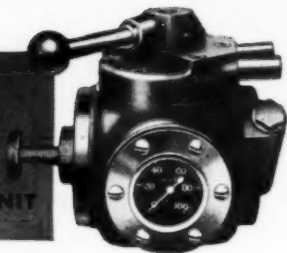
Whether you have a Moto-Tool or any other type of grinder, we only provide Dremel shop-tested Accessories — steel cutters, emery wheel points, brushes, sanders.



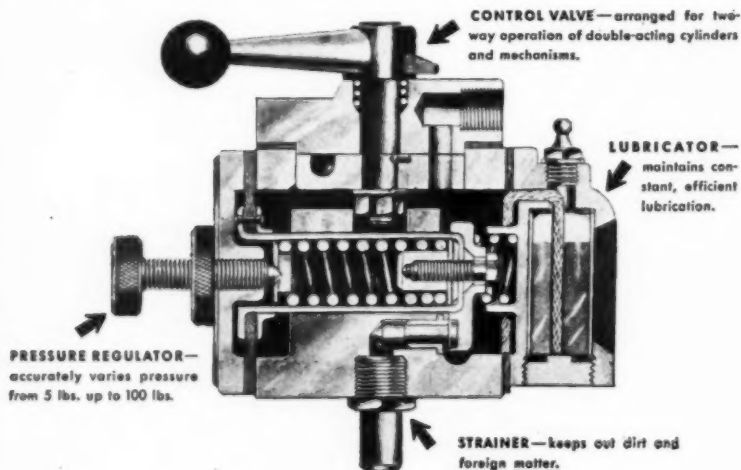
DREMEL MFG. CO. Dept. 214-H RACINE, WIS. U.S.A.

Marton

AIR CONTROL UNIT



This convenient unit is adaptable for all air operated machines wherever air control is required. Pressure regulator, gauge, strainer, lubricator and control valve are combined in one efficient, time-saving mechanism.



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SMALLPEICE

MACHINE TOOLS AND EQUIPMENT MANUFACTURED
IN U. S. A. AND GREAT BRITAIN

OHIO
STEP UP
PRODUCTION

OHIO *Revolving* TABLES



Round or Square, 24" to 96", in Many Combinations

The 96" Ohio Revolving Table is designed primarily for use with floor type horizontal boring mills, but can be used with other types of machine tools. Intended for extra heavy duty service and large jobs, it carries a load of 20,000 to 25,000 lbs. with ease.

Ohio Revolving Tables are the expression of over 50 years' machine tool manufacturing experience. They are high grade precision units, accurately graduated in $\frac{1}{2}$ degrees. They can be supplied with indexing pins with any number of indexing positions or precision indexing units. You can arrange them to suit all types of

standard horizontal or vertical boring machines.

96" table illustrated. Height overall—36". Thickness of table top—14". Anti-friction raising device for rapid and easy revolving. Pressure lubrication. Power rapid traverse. Four precision dial or index pin positions for indexing.



48" square worm feed revolving table

THE OHIO MACHINE TOOL COMPANY, KENTON, OHIO

OHIO

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HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

For Smoother Performance



USE ATLANTIC Contour Cutting BAND SAW BLADES

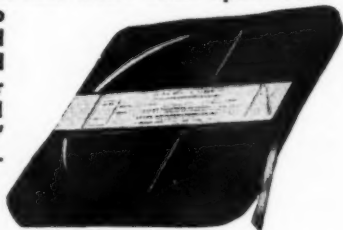
You will welcome Atlantic Band Saws in your shop. The teeth are set to permit a smoother performance for radius cutting. The special alloy steel insures longer wear and you can weld them easily.

IMPROVED PACKAGE

One of the strongest, most practical and convenient boxes on the market. Cutaway feature shows inventory at a glance.

Box is solid chipboard construction that won't come apart. Saw securely held in coil form, no bothersome wires to cut. Required lengths freely removable. Marked on end as well as top of box for easy identification. Packed in all widths 3/32" to 1/2" wide in 100' lengths. Number of teeth as permitted by W. P. B. ruling.

Send for Atlantic Band Saw Booklet



ATLANTIC SAW MFG. CO., Inc.

Manufacturers of Metal Cutting Band Saw Blades Exclusively

153 Brewery St., New Haven, Conn.



It pays to have your worn cutters reground by Severance

Worn, dulled cutters reground by Severance are exactly the same as new. Severance regrinders are not just "regrinding experts," they are the same new tool craftsmen, using the same precise skill and care as they do in grinding new tools from the solid.

After regrinding, each cutter is further improved by the exclusive "Severite" heat-treat process that increases tooth hardness and thus lengthens cutting life from three to five times. This "Severite" heat treatment costs you nothing—it is simply another of the many ways

in which Severance gives you more for your regrinding dollar.

Severance service, too, is an advantage to you. There are six complete Severance plants located strategically throughout the United States. Check up on the worn cutters, rotary files, burrs, etc. in your plant now. For best service, send them to the Severance plant nearest you for a factory regrinding job.

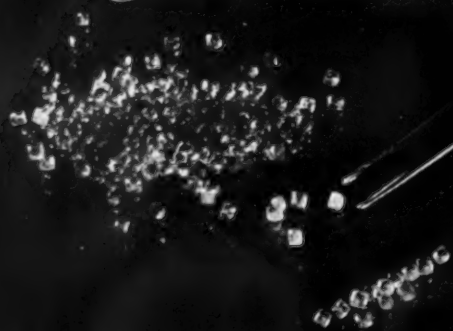
Severance

MIDGET MILLING CUTTERS • PRECISION REGRINDING

Severance Tool Industries Inc., Saginaw, Mich. • Plants in Long Island City 1, N. Y.; Detroit 2, Mich.; Fort Wayne 8, Ind.; Chicago 6, and Los Angeles 21. • In Canada: 60 Front St., W., Toronto, Ont.

LIKE TO PICK YOUR OWN

Diamonds?



Get a selection from Wheel Trueing's big stock . . . choose those you want and get exactly the kind of diamonds you prefer.

While the introduction of highly specialized engineered diamond tools (which Wheel Trueing pioneered) has done much to change buying habits, there are still plenty of diamond-wise production men, purchasing agents and heads of grinding departments who thoroughly understand the characteristics of diamonds, who are competent buyers and who still prefer to select mounted stones.

Many of these experienced buyers have bought their diamonds from Wheel Trueing for a third of a century or more and in many instances have the selecting of diamonds for their needs entirely in the hands of Wheel Trueing.

With Wheel Trueing sales offices located strategically throughout the country, it is an easy matter for us to get diamond assortments to you for your inspection and selection and you will find in every Wheel Trueing diamond assortment, the high quality that results in worth-while production economies.

Your inquiry will receive prompt attention.

Send for a copy of our booklet "Tips on Using Diamond Tools." You'll want copies for all your operators.

WHEEL TRUEING TOOL COMPANY

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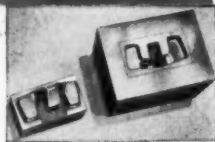
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Windsor, Ont. • Canada

Feeling the Pulse of 6,000,000 lbs.

where Quality Production calls for SENSITIVE CONTROL...



Elmes 3000-Ton Hobbing Press at Midland Die & Engraving Company. Bullet-proof glass shutter and metal side shields protect operator. Micrometer depth gage indicates slide movement. A compact machine, ruggedly built and thoroughly dependable.



Hob and clean Midland hobbed cavity for die cast lock strike



President A. J. Bachner

In five short years, Midland Die & Engraving Company of Chicago has earned a national reputation for precision work on intricate hobbed cavities for plastics molding and die casting—work that demands experience, skill, and utmost accuracy in equipment at every stage of production.

From the start, Midland hobbed cavities have been sunk on a 3000-ton Elmes hydraulic hobbing press, a machine so easy to operate, so instantly and unfailingly responsive to control, that operator Jackson manipulates this titanic 6,000,000-pound force with amazing dexterity and speed. Sinking a hardened steel hob into a blank of cold steel is a matter that

calls for good judgment and implicit confidence in the ability and performance of the press, if hobbed cavities are to measure up to Midland's high standards.

"We think a lot of our Elmes," says Supt. Nels Rundgren. "There's been no trouble of any kind and the slide packings have been renewed only once." To which President A. J. Bachner adds: "I've seen them all. Elmes is the press for us. It has been a very important element in our success. That's why our new 1000-ton press is going to be an Elmes, too."

Send for literature on Elmes hydraulic pumps, accumulators, or any type of metal working press you need.

ELMES ENGINEERING WORKS OF AMERICAN STEEL FOUNDRIES, 244 N. Morgan Street, Chicago 7

ELMES HYDRAULIC EQUIPMENT

Also Manufactured in Canada

METAL-WORKING PRESSES • PLASTIC-MOLDING PRESSES • EXTRUSION PRESSES • PUMPS • ACCUMULATORS • VALVES • ACCESSORIES

A size and type to meet your needs.
Capacities, 5 to 150 gpm—Heads, 5 to 125 feet.

Ask us...

**about
your coolant
pump applications**



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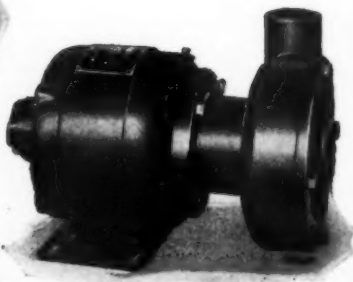
Our engineers are experts in hydraulics. They will check your coolant pump hook-up and suggest a suitable Ingersoll-Rand unit to do the job.

Such check-up enabled one machine tool builder to increase the capacity of his tool and at the same time reduce his pump costs. Perhaps your hook-up cannot be improved—but there is no obligation involved in a check-up. Ingersoll-Rand Company, Cameron Pump Division, 11 Broadway, New York 4, N. Y.

Ingersoll-Rand

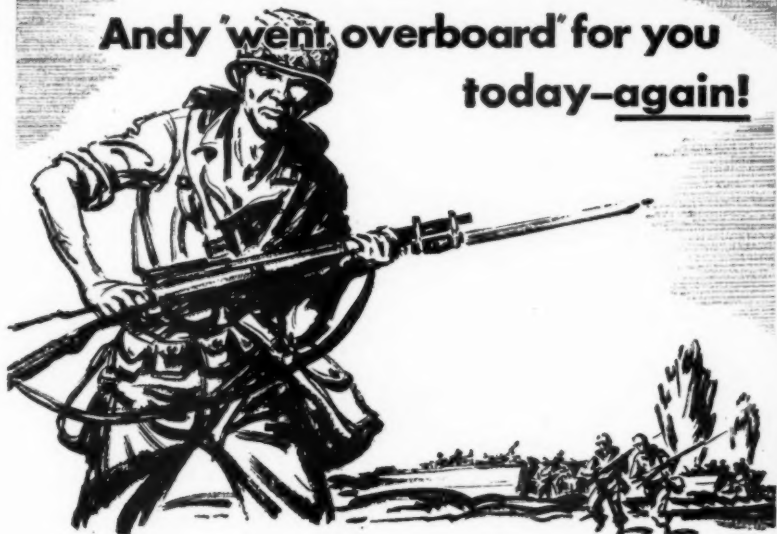


63592



9-377

Andy 'went overboard' for you today—again!



SOMEWHERE out there early this morning Andy and his gang went overboard in a surprise attack that will make history. That recalls other days when as salesman for your Industrial Supply Distributor ♦ Andy used to "go overboard" regularly to help locate the hard-to-get materials you had to have to keep turning out war stuff on schedule.

Overseas training is helping to qualify Andy for a better job with your Industrial Supply Distributor, come peace. Meanwhile please

remember that because his organization has devoted years to preparation for the peak demands of Industry, your Distributor has earned the opportunity to help you keep your present war production up to schedule.

Your Distributor can furnish everything you need in equipment, materials, supplies. Make him your central source instead of ordering from the factory and you will save manpower and time, reduce paper work and expedite your deliveries.

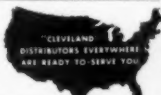
Till Andy comes home—and from then on—

Telephone your ♦♦♦♦ FIRST!



TWIST DRILL COMPANY
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CLEVELAND

300 BROAD ST. NEW YORK 400 NORTH ZEEBROOK RD. CHICAGO 840 HENRIOT ST. SAN FRANCISCO
840 SECOND AVE. DETROIT LONDON - E. P. BARRIS, LTD. - 20-26-27 UPPER THAMES ST. E.C.4



DE-STA-CO *Toggle* CLAMPS for CLAMPING PARTS IN PRODUCTION

Used for clamping production parts in fixtures, as for machining, drilling, reaming, riveting, welding, sawing, routing or assembly operations. Easy, positive clamping, instant release. The modern, efficient, low-cost method. Also used for clamping plywood and plastic parts.

MODEL 210-S

A medium heavy model. Measures $7\frac{1}{4}"$ high by $5\frac{1}{2}"$ wide overall when in locked position. Also available with "U" shape bar.

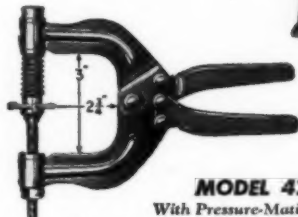
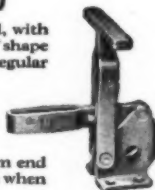


MODEL 205-A

A small, light duty, horizontal style clamp. In this model clamping bolt is provided with rubber tip to prevent marring surface finish of part to be clamped. Measures $1\frac{1}{2}"$ from bottom to top of base, and $5\frac{1}{4}"$ from tip to tip when in locked position.

MODEL 207-TU

A small light duty model, with "T" shape handle and "U" shape bar. Also available with regular shape handle and with solid, straight bar. Model illustrated measures $2\frac{3}{4}"$ from bottom of base to top of work arm and $3\frac{1}{2}"$ from end of work bar to end of base when in locked position.



MODEL 470

With Pressure-Matic Feature

A portable clamp with Pressure-Matic feature which provides automatic adjustment from any selected set clamping thickness up to as much as $\frac{3}{8}"$ variation without gap readjustment. Spindles copper plated against welding spatter. Quicker—easier than "C" clamps.



MODEL 462

Small portable clamp, only $7\frac{1}{4}"$ long. Pressure-Matic provides automatic adjustment of spindle gap, no manual adjusting to do. Clamps any thickness from 0" to $\frac{3}{8}"$.

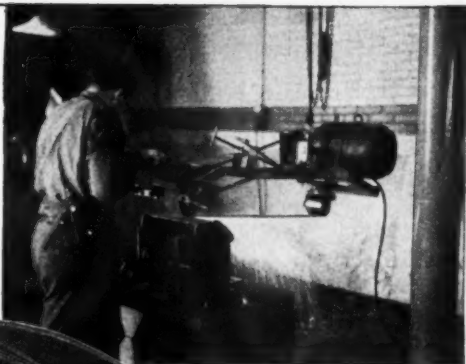
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DETROIT STAMPING CO.
Established Over 25 Years
347 Midland Ave • Detroit 3, Mich.

NORTON ABRASIVES

Here you see the seam weld on a steel housing being both rough-ground and finished in the same fast belt operation.

Note the shower of sparks! Yet the belt disperses heat quickly.



METALITE CLOTH BELTS

Improve Swing Frame Grinding!

NATURALLY! Their greater area and sharper surface obviously provide cooler, faster cutting and better finish.

A maker of stainless steel tanks for milk trucks, where finish was paramount, was influenced by one of our men to adopt this modern method for polishing the entire inside of the huge saucer-shaped end—a tough proposition.

Result: One man, one shift, now keeps ahead of a schedule that formerly required two men, two shifts.

If you run a Swing Frame Belt Grinder, send for our brochure "Metalite Cloth Belts Improve Swing Frame Grinding." If not, we can send you manufacturer's literature on the Grinder itself. Here's a handy coupon.



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(DIVISION OF NORTON COMPANY)

Please send the following literature:

..... Metalite Cloth Belts, etc. The Swing Frame Abrasive Belt Grinder

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City _____ Zone _____ State _____

By _____ Title _____

NOW AT *Reduced* COST!



BENCHMASTER'S 6" ROTARY TABLE

benchmaster—the name for quality bench machine tools—now offers its small, accurate rotary table at \$45 (FOB Factory). Increased production—by your demand for this rotary table—improved workmanship; giving an even higher standard of quality, have made this new price possible.

Table diameter—6" • Worm Gear Ratio—60 to 1 • Bevel Dial Graduated in 1/10 of a degree • Table Graduated, 360° • Center Hole— $\frac{3}{8}$ " • "T" Slots— $\frac{1}{2}$ " x $\frac{3}{8}$ " • Two crossing at 90°, forming two quadrants • Height—2 $\frac{1}{8}$ " • Weight—14 $\frac{1}{2}$ lbs.



manufacturing company

2952 w. pico, los angeles 6, cal.
formerly Duro Mfg. Co., of Los Angeles

BORN WITH

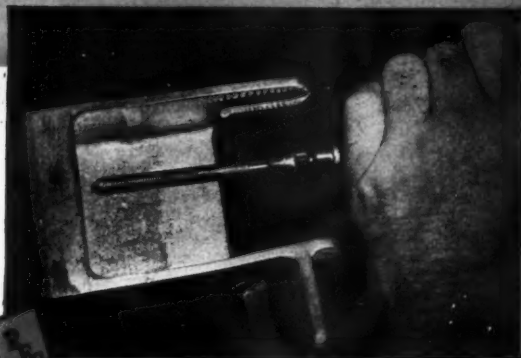
Upper
AND *lower* SETS



Its lower set of teeth bite rapidly into a small casting. Then it uses the upper set to neatly chamfer the casting. This RFC HAND-CUT ROTARY FILE—illustrated at the left—is no more remarkable, however, than many of its brothers among the RFC special shapes.

The RFC is an interesting family of rotary files ... standard or special ... in high speed steel or high carbon steel. The hundreds of plants that have adopted them class them among the "best little workers in the factory." They come in all shapes and sizes. Unsurpassed for precision and speed—even in hands not the most skilled.

• If hand-filing is slowing up some of your work, you likely have a problem that an RFC file would enjoy getting its teeth into. May we discuss it with you? Or, write for the new RFC catalog.



**The ROTARY
FILE COMPANY**
STRATFORD, CONN.

This **MID-WEST**
Super-Cut Wheel
SOLD ITSELF the *"HARD WAY"*



MID-WEST SUPER-CUT WHEELS, ideal for tool room work, are engineered for fast-cutting and smooth finishes. Made in two types—red and white—and with a range of grain and grade sufficient to handle any high speed steel tool operation.

MID-WEST
ABRASIVE COMPANY

Manufacturers of **DEPENDABLE** Abrasives
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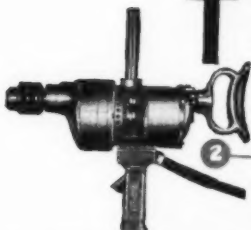
Mounted on a surface grinder in the cutter grind department of a large war plant this MID-WEST SUPER-CUT wheel (Type 1, 10 x 3 1/4 x 3, 2.46 KY6) was put through a test few, (if any) other wheels could withstand.

The competing wheel the company had been using for grinding high speed cutting tools was removing from .006 to .007 inches stock per cut. Its edges were broken. It was generating too much heat and the finish it produced was "just satisfactory." A MID-WEST SUPER-CUT wheel was mounted on the machine and the operation continued, using the same feeds and speeds. The edges of the wheel remained sharp and clean, virtually no heat was generated and the finish was much better.

THEN THE OPERATOR GAVE OUR WHEEL THE WORKS! Stock removal and cross-feed were changed to .020 inches — a veritable hogging operation. At one time the wheel was crowded so hard it actually stopped the machine! But under these conditions the wheel removed stock easily — without burning the tool and left a good finish. Obviously MID-WEST SUPER-CUT wheels were ordered for that important operation.



1 Clark "ACE" 1/4" Drill is very light in weight, yet has the power of larger tools.



2 Clark 3/4" Heavy Duty Ball Bearing Drill for contractors, car & locomotive shops, & auto repair shops.



3 Clark 1/2" Heavy Duty Ball Bearing Drill for regular, low cost operation. Light, speedy.



4 Clark 1/2" Heavy Duty Ball Bearing Drill. Longer service at lower upkeep.



5 Clark 6" Ball Bearing Aerial Grinder — more power & capacity than other like types.



6 Clark 1/4" High Production Ball Bearing Drill for horizontal or vertical drilling position.

CLARK *drills*

Built to fit any job

Built to give you maximum performance at a low upkeep cost.

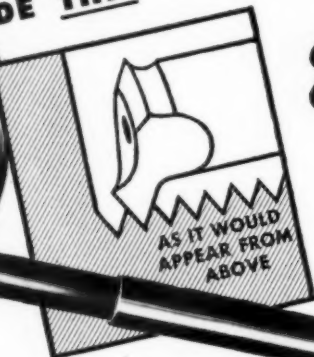
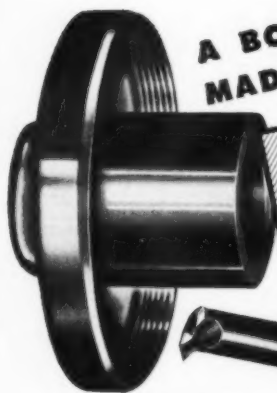
Clark Drills are built under the famous Controlled Construction Method, which means all major parts are designed and built at the James Clark, Jr. Electric Company Plant. Construction of these parts, and assembly of all tools, is always under careful inspection—assuring highest possible quality and longer life for all Clark Drills.



JAMES CLARK JR. ELECTRIC COMPANY

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**A BOKUM BORING TOOL
MADE THIS TOUGH THREADING
JOB**



Easy

**STYLE C
SINGLE POINT**

... and



IT WILL MAKE YOUR THREADING JOB EASY

Shank of tool is lined up parallel with line of centers. Bisecting line of thread is always at right angles to machine axis.

In blind holes, threads can reach clear to bottom—no other tool like it. Easy to use. Reconditioning does not change ground thread form (tool is resharpener on top surface only).

Results: accuracy and long life.

*For super High Speed Tools ask for Catalog H-1139
and for Carbide Tipped H-398.*



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Back of every Lake Shore Tool are the facilities and skilled personnel of one of America's most completely equipped plants.

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TOOL WORKS INC.

Send us your blue prints for quotations on your high speed tool, special tool, and carbide production tool requirements.

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SPECIALS**

Bring to your job faster production, greater accuracy, and remarkable savings in time and money *with* **ARNOLD special tools**. Reamers, Arbors, Counterbores, Keycutters and special types . . . all represent thirty years specialized experience in designing and manufacturing dependable cutting equipment. Rely on and specify **ARNOLD** tools for maximum efficiency in your operations. Write for your copy of our new 40 page catalog today. If the tool you need is not shown in it, just send us your blueprints . . . we'll supply precision tools to fit your exact job requirements.



ARNOLD
Tool Company

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Carbide Grinders

These rugged, streamlined grinders are modern in every respect. They are unsurpassed for most rapid rough grinding and finishing of carbides, stellite, high speed steel and other modern tools.

Furnished in bench or floor type, of several capacities, for wet or dry grinding, as desired. Attachments for chip breaker and drill grinding.

MODEL
BB



A FEW SALIENT FEATURES:

- Quick-acting indexing tables.
- Adequate wet-grinding equipment.
- High Grade ball bearing spindles.
- Oversize wheels, giving longer wheel life, and permitting grinding of larger tools. Moderate price.

Prompt Deliveries
Write for Details

MODEL
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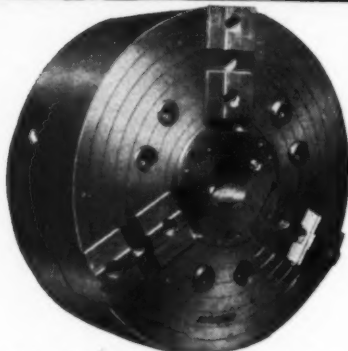


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with "Airgrip" Double-Action Devices



"AIRGRIP" CHUCKS

YOUR judgment will be doubly vindicated when you invest in "Airgrip" Chucks — (1) *Immediately*, because your output records will rise — 25% and more — and your manpower problem will be eased; (2) *Later On*, because the unit-cost-cutting

achieved with these improved, lathe-modernizing chucks will enable you to meet returning competition.

"Airgrip" Chucks offer "two-fisted" *double gripping power* because of the cam's *wedge action* (which operates in *both directions*) and locks the jaws mechanically, whether gripping internally or externally.

Work is held tight even if air supply is cut off completely.

Both the two-jaw and three-jaw "Airgrip" Universal Chucks permit using heavier cuts and coarser feeds to the very limit of the machine's power and cutting-tool endurance.

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Double-acting ball-bearing, high-speed revolving air cylinder with maximum life and minimum maintenance. No manual adjustments required. Wear automatically taken up by air pressure within the cylinder.

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3000 lb.-Pressure Pump driven by a ½ h.p. motor! Double-Pressure Production; consists of a low-pressure section which supercharges a high-pressure section. Builds up pressure fast, with minimum pulsation.

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Forms boxes or pans from one piece of metal. A straight brake as well as a box brake. Ideal for experimental shops.

All Chicago Brakes are built of rolled steel welded sections which insures great strength, accuracy and long life.

Up to the minute in design and workmanship, they fit the present need for fast production sheet metal working machinery.

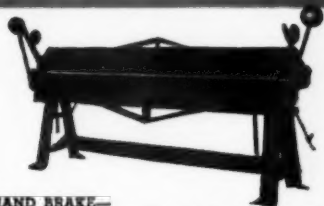
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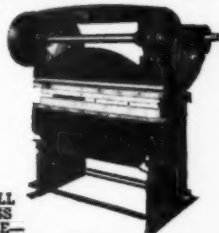
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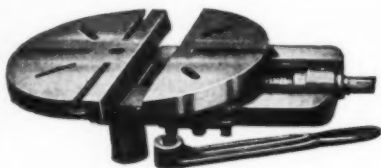
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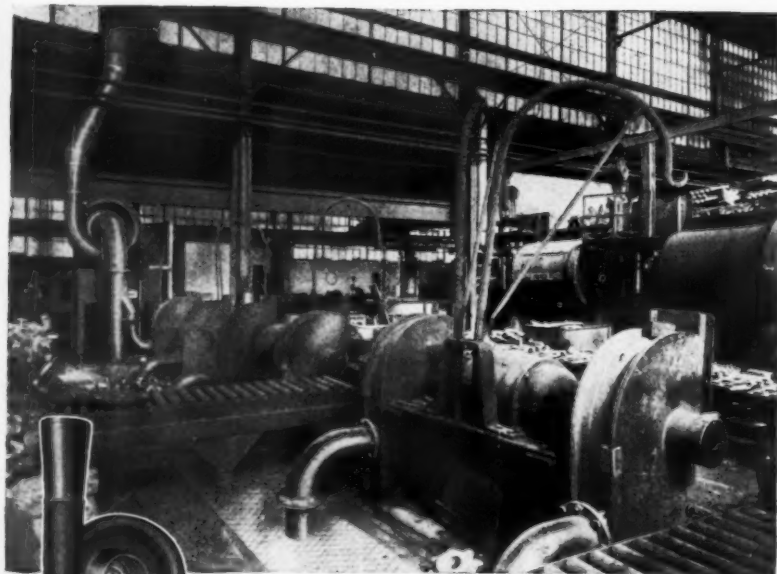


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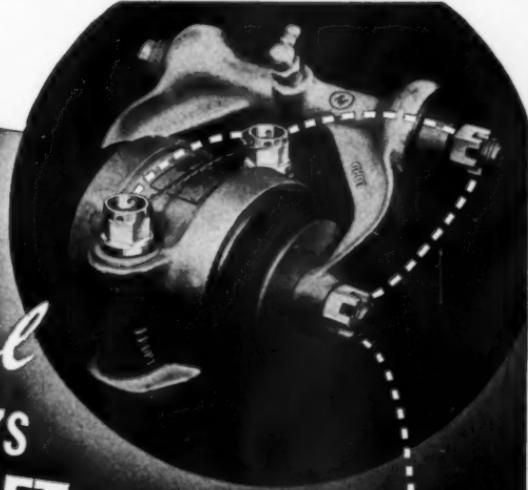
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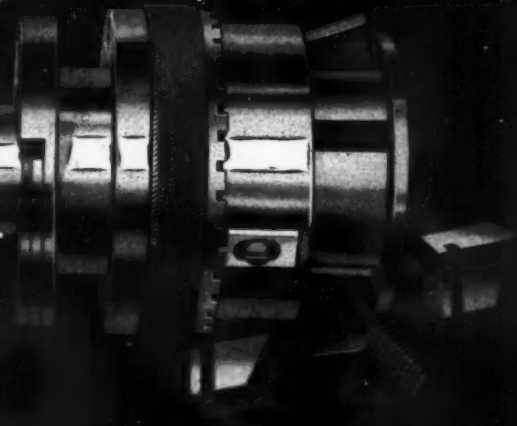
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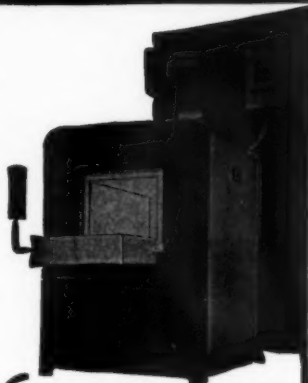
AVAILABLE IN TWO SIZES

Type	Chamber Capacity	Amps 115 V	Watts	Amps 230 V	Price
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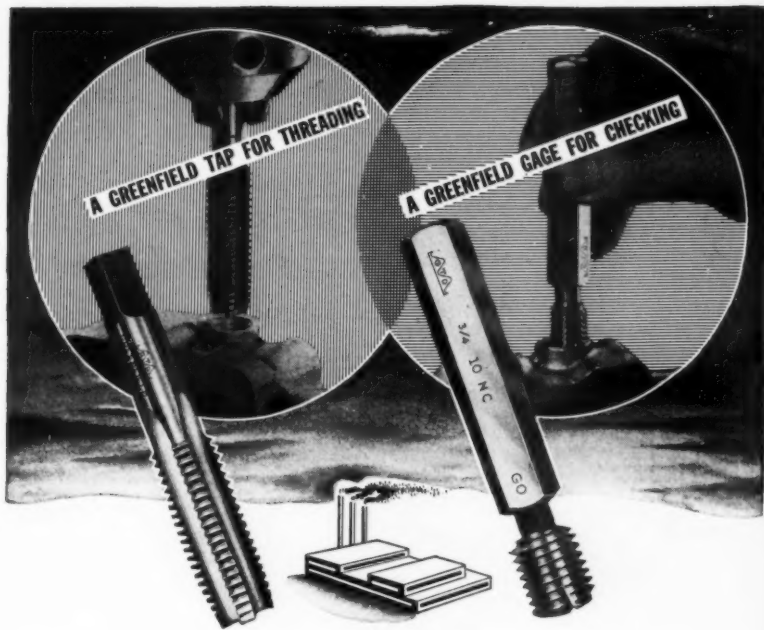
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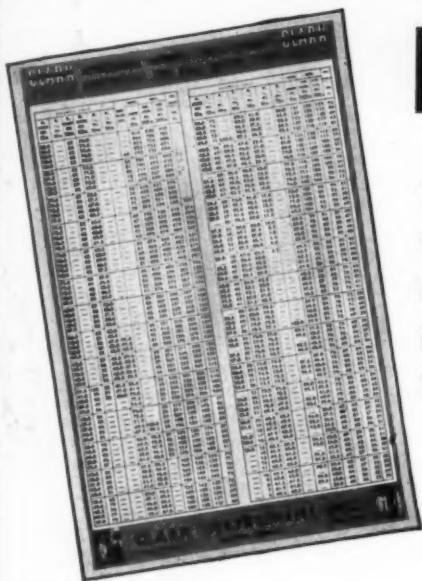
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Fireproof cotton batting is now being made for upholstery and insulation.

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A plant has been built for processing large quantities of the lowly milkweed. The floss is a good substitute for kapok in upholstery, an oil for paint is made from the seeds, wallboard can be made from the stalks, and latex extracted from the leaves.

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A new machine checks the size of ball bearings at rates as high as 20,000 per hour.

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New sleeping cars have a triple deck arrangement of berths.

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A new microscope converts an invisible ultra-violet image into a visible full color picture without the use of photography or fluorescent screens.

You'll need production like this in the days AHEAD



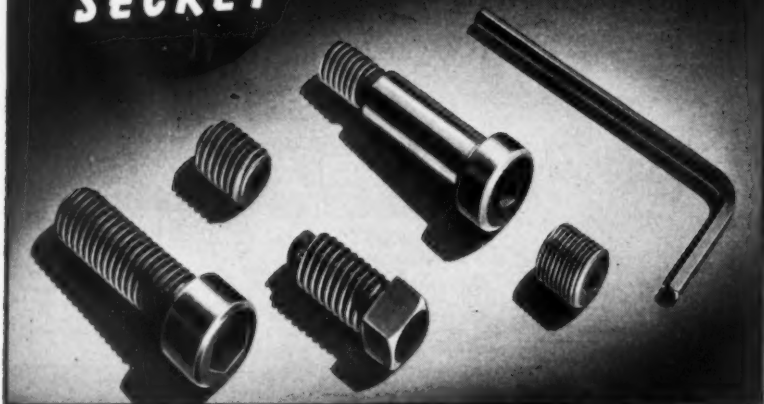
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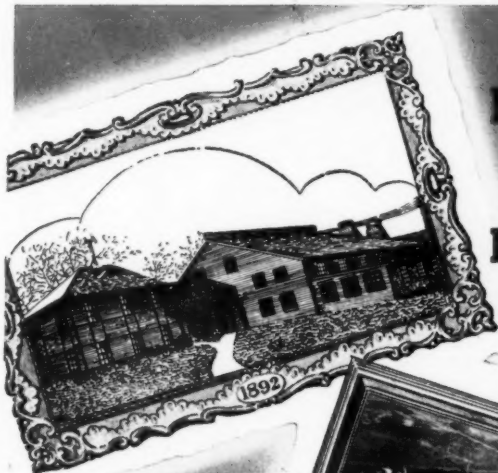


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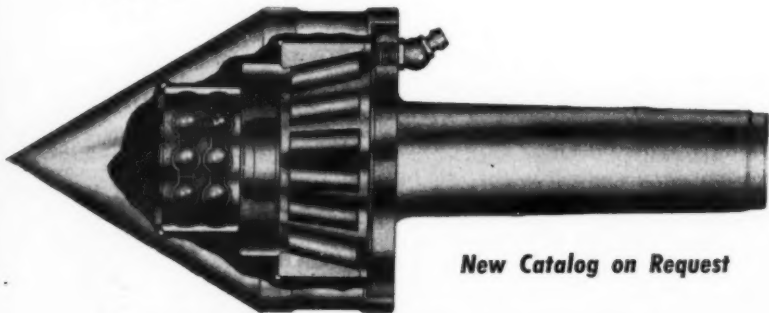
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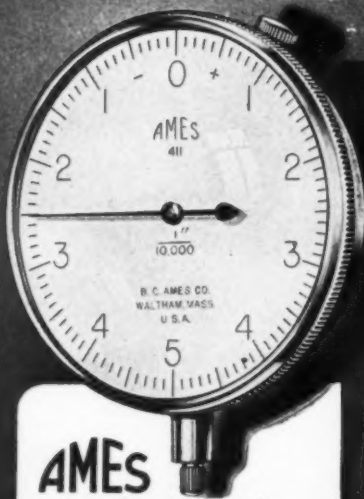


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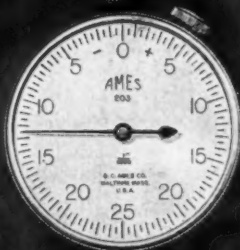
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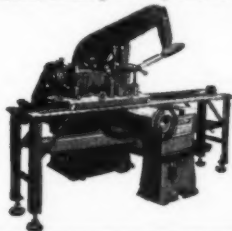


A STANDARD Racine Saw many times eliminates the need of a special machine to perform a special metal cutting job. The tilting saw guide, open front design and exceptionally rugged construction of Racine Saws, make them easily and readily adaptable to many special metal cutting operations.

Racine's Hydraulic Control of feed and pressure of the saw blade provides fast, efficient cutting of any metal from soft

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Available are a complete range of sizes in capacities 6" x 6" to 20" x 20". Write for Catalog No. 12 for complete information. Address Dept. MT-S.



SPECIAL FIXTURES ARE EASILY ADAPTABLE TO STANDARD RACINE SAWS

At left is shown a standard Racine Machine equipped with a special fixture for cutting crank-shaft test sections and forging flash. Special jigs and fixtures are easily mounted for sawing odd shaped material or special pieces. Racine engineers invite your inquiries on special and standard metal cutting jobs—no obligation of course.



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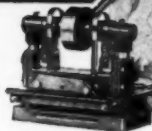


METAL Stampings

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WITHOUT
DIES**

With DI-ACRO Precision Machines

If you desire to save time and critical materials on production of metal stampings or other small parts, then the DI-ACRO System of "Metal Duplicating Without Dies" merits your consideration. It is based on the rapid and accurate production of formed parts with DI-ACRO Shears, Brakes and Benders. All duplicated work is accurate to .001". These precision machines are adaptable to an endless variety of work, and ideally suited for use by girl operators. For short runs your parts are processed in a matter of hours instead of waiting weeks for dies.



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SHEARS

Di-Acro Shear squares and sizes material, cuts strips, makes slits or notches, trims duplicated stampings. Shearing width—Shear No. 1—6". Shear No. 2—9". Shear No. 3—12".

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Di-Acro Brake forms non-stock angles, channels or "Vees." Right or left hand operation. Folding widths: Brake No. 1—6". Brake No. 2—12". Brake No. 3—18".

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Di-Acro Bender bends angle, channel, rod, tubing, wire, moulding, strip stock, etc. Capacity—Bender No. 1— $\frac{1}{4}$ " round cold rolled steel bar. Bender No. 2 and No. 3— $\frac{1}{2}$ " cold rolled steel bar.

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without sacrifice of quality. We will study your handling needs with you and help you plan the design on which the best delivery can be made."



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Manufacturers of the
CORRECT wire rope for your equipment

Left-to-Right Lay Braided Slings
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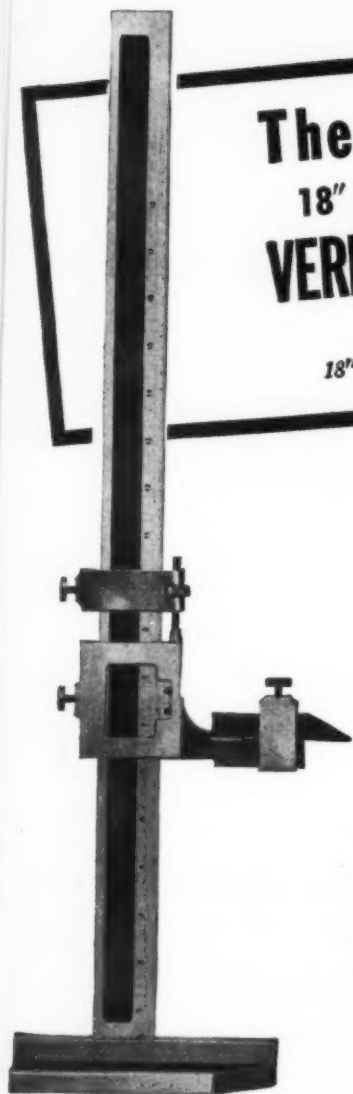
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"Lifting safety to new heights"

Don't stop now—buy more War Bonds!

When larger cranes are built, Macwhyte ATLAS Braided Wire Rope Slings
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Manufacturers of

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Put 'em on... Take 'em off...

with
**Controlled
Torque!**



NEW!

THE ARO PNEUMATIC IMPACT WRENCH

● This new ARO Model 131 Reversible Impact Wrench says "when" automatically—it's the *only* impact wrench with Controlled Torque!

Specially designed to increase the speed and accuracy of nut and bolt setting operations up to $\frac{3}{4}$ " size...sets bolts and nuts without danger of stretching or "burning".

The simple impact roller clutch mechanism has

only 4 parts and is so constructed that when predetermined torque is reached, the rollers rebound out of engagement with the hammer, thus avoiding any chance of stretching the bolt. Operator controls torque by merely turning calibrated adjusting screw. Write for new catalog No. 44.

The Aro Equipment Corporation, Bryan Ohio.



for **QUICK
change-overs**



\$197.50
Immediate
Delivery

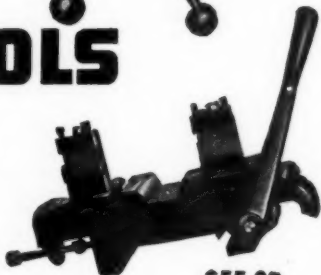
UTILITY TOOLS

In a matter of minutes you can convert your engine lathes into screw machines. Simply remove tail stock and install a Utility Turret and Crossfeed Cut-off. Turret has rack and pinion which assures steady feed. Raised bearing surface eliminates all chip trouble. Has two taper gibs for take-up and alignment. All ways and bearing surfaces are ground. All inserts, bushings and pins are hardened and ground. Hex is $5\frac{1}{8}$ " across flat, $2\text{--}7/16$ " thick. Accommodates a $3/4$ " hole or a No. 1 or 2 Morse taper. Fits Logan, South Bend, Atlas, Craftsman, 10" Sheldon, Clausing, etc. Cross Slide pictured here has rack and pinion, two tool holders with adjustable jacks. Weight approximately 40 lbs.

Collet Closer parts are hardened and ground. Full ball bearing. Only wear is on ball bearings. Write for detailed literature and prices.



\$60.60



\$55.00

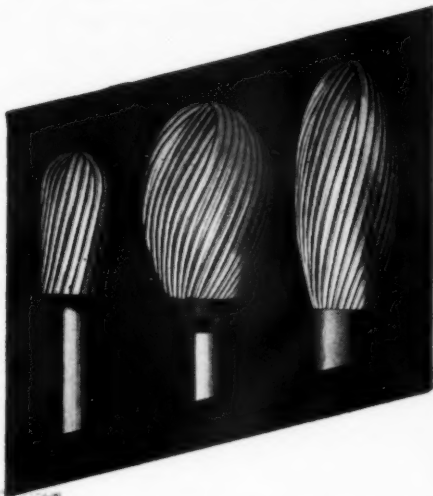


TOOL and DIE MFRS.

**1370 West Washington Blvd.
LOS ANGELES 7, CALIFORNIA**

The Shape

OF THE
BUR
TELLS YOU
LITTLE!



Here are four Pratt & Whitney machine-ground burs. If you are a bur user, they probably look familiar because they have the same general shapes found in ordinary hand-ground burs. But the resemblance stops right there.

Human Element Removed: Pratt & Whitney burs are *machine ground* from solid. Each one is a precision cutting tool — every flute spaced *exactly* with relation to all others — each cutting edge with precisely the *correct rake* — all *teeth* identical in height and chip clearance. And every bur is ground *concentric*, to run true on its shank. There is no guesswork or human error in these burs . . . they didn't just "grow," like the garden-variety of hand-ground bur. Our special bur-grinding machinery takes out all the human error — assures you of smoother operation, smoother results in finished work, greater production per hour and per bur.

More For Your Money. Try Pratt & Whitney Kellerflex Burs on your next order. They will give you more for your money because each one is precision made on special machinery designed by Pratt & Whitney engineers for the purpose.

PRATT & WHITNEY
Division NILES-BEMENT-POND COMPANY
KELLERFLEX SALES DIVISION
WEST HARTFORD 1, CONN.



**TO ACCURATELY GRIND
IRREGULAR PIECES**

Square or odd-shaped pieces may easily be held as shown in the illustration. Simply weld a plate to round shank, insert guide pins and clamp firmly.

**You'll find 101 USES for this
UNIVERSAL PRECISION INDEXING HEAD**

All of your regular tools will fit the standard No. 4 Morse, straight shank Hardinge collets or, with a conversion sleeve (extra), No. 9 B. & S. without the use of a special set-up as shown above. No other piece of equipment in your shop is so adaptable and versatile . . . nor more accurate. Graduated 360° in three planes, for every simple or compound angle. Can be used on any tool or surface grinder. Prompt delivery.

Write for illustrated folder.

CLEVELAND
TOOL ENGINEERING COMPANY

1249 WEST 4TH STREET

CLEVELAND, OHIO



Helping Build the Ring of Steel Around Our Enemies!

As the tool that takes the first bite into metal for American armament, Progressive Shear-Cut End Mills are cutting faster, longer, and cleaner on the toughest jobs.

The Shear-Cut construction permits working to extremely close tolerances, minimizes chatter, and gives uniform cutting action. Feeding accurately, these end mills give adequate, rapid chip clearance . . . are precision made of the finest materials.

Progressive Shear-Cut End Mills are now manufactured by Siewek Tool Division of Domestic Industries, Inc. . . . the same high quality product with the *added* resources and service of Domestic Industries, Inc.

Specify "Shear-Cut" when you need end mills. Let them prove to you how precise a tool an end mill can be. Write for catalog 5E.

SIEWEK-BUILT PROGRESSIVE

SHEAR-CUT

END MILLS

SIEWEK TOOL DIVISION

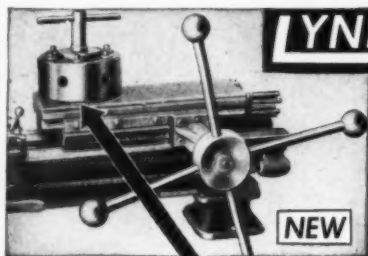
OF DOMESTIC INDUSTRIES, INC.

DETROIT (FORDALE STATION) MICHIGAN



Domestic Industries
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Affiliated with Siewek Engineering Division — Chicago; Hartford, Conn; and Springfield, Mass. — Producers and Builders of Tools, Dies, Jigs, Fixtures, Patterns and Special Machines



LYNN

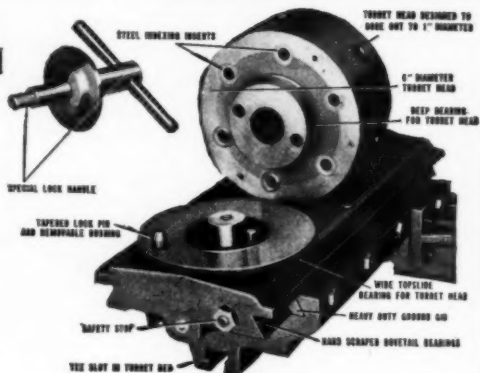
HEAVY DUTY,
Self-Indexing

CONVERSION

BED TURRETS

LYNN BT-2 with Pilot Wheel

For bench or small engine lathes with 9" to 13" swing, 6 positions, 6" head, 5½" travel, stops for each position. 10 to 1 leverage pilot wheel facilitates smoother cuts, reduces number of operations.



Do Turret Work on Your Present Lathes

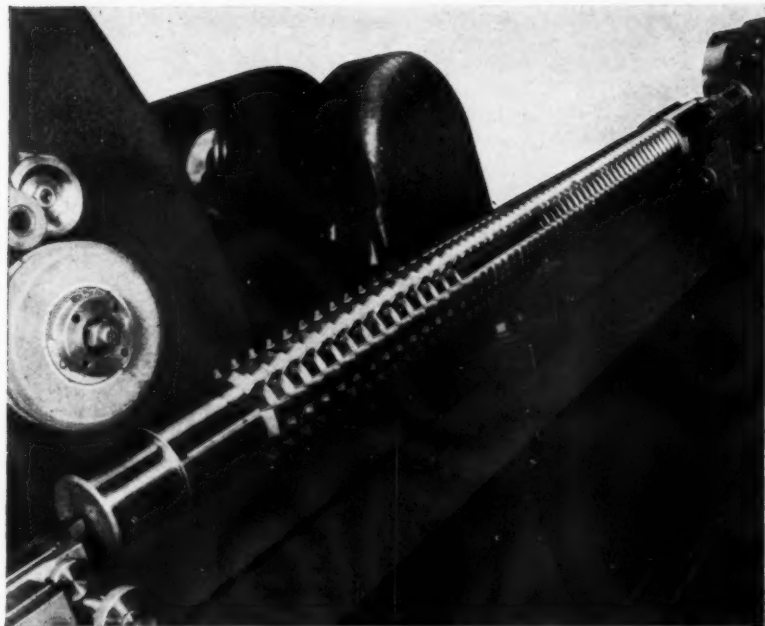
LYNN Heavy Duty, Self-Indexing Bed Turrets give you *immediate conversion* for turret work. Easily, quickly mounted on present idle or unproductive lathes, equipping them to handle multiple operations rapidly on a wide range of work. A model to fit any size and make of standard engine lathes, from 9" to 28" swing. Engineered as smartly and machined as finely as the best turret lathes.

Also, LYNN Bed Turrets for *replacements* on standard turret lathes; LYNN Self-Indexing Tool Post Turrets and Cut-off Cross Slides—a complete line of LYNN Tools to Speed Production.

Distributed nationally through jobbers. Immediate delivery from stock or factory.

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SPLINE BROACHES UP TO 84 INCHES LONG. Complete Broach Tooling and Engineering Service . . . GAGES, Serration, or Spline, male or female . . . Master Gears and Gear Racks . . . Master Index Plates

. . . Splined Arbors for gear-grinding . . . Hobbing, Shaving and Checking . . . Gear Designing and Engineering . . . Form Cutting Tools . . . Production Broaching and Machining.



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Broach & Gage Company

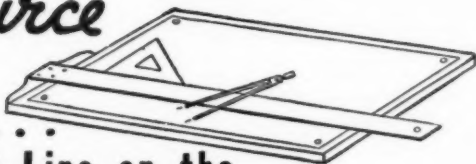
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tools to produce, or the
production itself. We work
from rough idea. Part
print — sketch — or just
talk it over with us. In-
quiries will bring prompt
quotations.

Tools — Dies — Jigs —
Gages — Fixtures — Spe-
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of parts in large quantities
— Production of assemblies
from raw material to fin-
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tion to our own equipment
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WHAT! NO FAN?

and it still runs cool!



THAT'S RIGHT!...
NO FAN IS NEEDED ON THIS
NEW **POPE** Sealed Package
SURFACE GRINDER SPINDLE
And That's One Reason For Putting
It On Your Machines Right Away

HERE'S THE STORY IN A NUTSHELL:

1. The POPE Sealed Package Spindle has a G-E motor sealed in. It runs at peak efficiency, without attention, for the entire life of the bearings. There is no fan, no air passages or openings of any kind. Dust, dirt, nuts, bolts and fingers are sealed out.
2. SKF Super-Precision, Double-Row Roller Bearings are sealed in, too. No oiling or greasing to bother with or forget.
3. It produces finer finishes; as a result of its better design and construction.

4. It does better work faster. This Spindle has the power, the bearing capacity and the rigidity to rough off surplus metal rapidly when required.
5. It operates horizontally, vertically or at any angle. This Spindle is ideal for boring mills, planers, milling machines and other machine tools for special work as well as for 6" x 18" surface grinders for which it is primarily designed.

See For Yourself What It Will Do On Your Machines And Your Work

The performance and operating advantages of this POPE Sealed-in Motor, Sealed Lubrication Spindle justify immediate consideration for replacement of existing spindles. For all the facts and figures, get in touch with



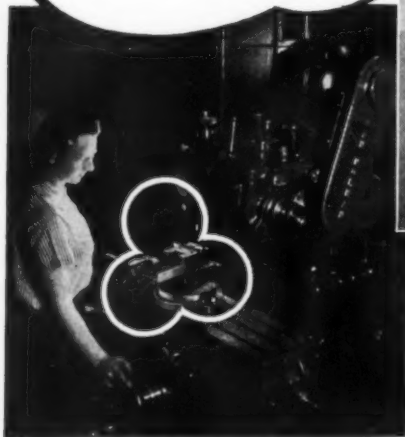
POPE MACHINERY CORPORATION

ESTABLISHED 1920

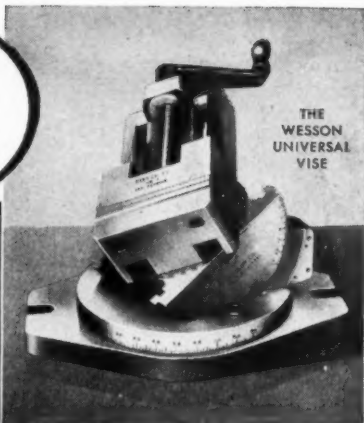
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BUILDERS OF PRECISION SPINDLES

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makes **ANY** operator
an **EXPERT**



Difficult angle set-ups can be made quickly . . . in a fraction of the time ordinarily required. Compact size, lowest overall height, ability to work in close quarters, and wide range of capacity permit many adaptations to standard machines . . . you multiply the uses of machine tools with WESSON Vises. Two sizes. See nearest distributor, or write for bulletin. WESSON PRODUCTS CO., 710 Fisher Bldg., Detroit 2, Mich.



THE
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UNIVERSAL
VISE

Don't let those "manpower blues" get you down when you have precision angle milling to do! Remember . . . WESSON Vises are immediately available. You can get them on the job, fast! And any operator can do expert precision angle milling, drilling, grinding, reaming, slotting, or what have you . . . with WESSON Universal Vises. Rugged and rigid, free from "chatter," these vises permit high speed precision-production or tool room service, and save time and money.



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Please send me illustrated bulletin of WESSON Universal VISES and ANGLE PLATES.

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Firm Name.....

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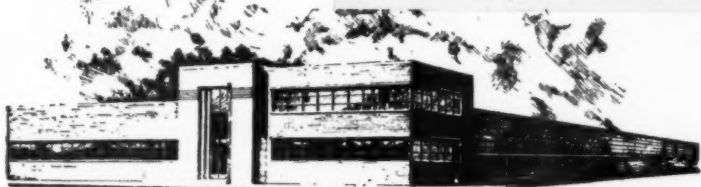
FULL SCALE PRODUCTION OF "MODERN PRODUCTS" RESUMED

The new plant of Modern Collet and Machine Company is now in operation! Now, with the finest, most modern production facilities... with a well-rounded and efficient personnel built around the key men of the former organization... full production is again being resumed. In addition to the well-known lines of Modern Collets and Modern Pushers, every type of screw machine tool and replacement part is again being manufactured. Rebuilding and modernizing of screw machines and modernizing of spindle carriers will also be regular Modern Collet services.



A WORD OF APPRECIATION

Our sincere thanks to the hundreds of customers who have cooperated so generously with us since our old plant was destroyed by fire. As we are now in a position to make steady reductions of our backlog, we can promise that very shortly Modern Collet will offer service that will be even more satisfactory than at any time during the past few years.



MODERN COLLET and MACHINE CO.

401 SALLIOTTE STREET • ROCHESTER, MICHIGAN

Precision-Made for Precision Work!

MICROMETER ADJUSTABLE
BORING BARS



Designed for rough,
semi-rough or finish
boring. Chrome nickel steel
heat treated and hardened.

Double Cutter

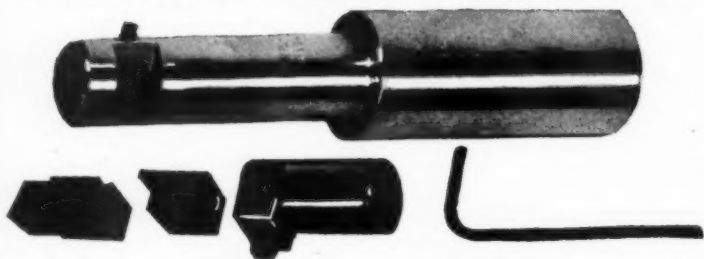
- ★ Accurate micrometer adjustment for diameters.
- ★ One set screw locks both cutters.
- ★ Cutters are identical permitting interchangeability.

Fly or Single Cutter

- ★ Accurate micrometer adjustment.
- ★ Cutters are interchangeable with Double Cutter Boring Bar.
- ★ Cutter is locked in place with set screw.

MICROMETER ADJUSTABLE

BORING BAR INSERT



- ★ Shoulder in insert maintains accurate location point.
- ★ Insert can be installed on any bar available by a simple boring and milling operation. Inexpensive and simple to in-

- stall. Print sent for making your own bar.
- ★ Cutter individually locked by sturdy set screw.
- ★ Micrometer adjustments are accurate and reliable.

Available in standard sizes or to your specifications

PROMPT DELIVERY

Write for complete details.

ACME TOOL CO. 200 CHURCH STREET
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Something New Has Been Added to HEIGHT GAGES

it's a —
Fine
Adjustment
and a **FEDERAL**
TESTMASTER



No more "tapping" is necessary when you set the Indicator to the gage blocks or master to the required measurement. The **fine adjustment** of the Indicator Bracket brings it into position positively and yet as lightly as a feather. The Bracket can be set anywhere on the upright.

MODEL 1492

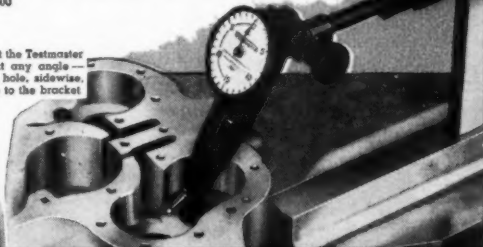
18" CAPACITY
Complete with—
FEDERAL
Testmaster No. 1, \$35.50
or
Testmaster No. 2, \$40.00

You get all three with the Model 1492, the Federal Testmaster Indicator, the Fine Adjustment Bracket and the 18" Stand, in a handsome wooden case. You will find it is more convenient, more precise and requires no figuring. Just set to gage blocks or master and check. Write for further details to—

FEDERAL PRODUCTS CORP.

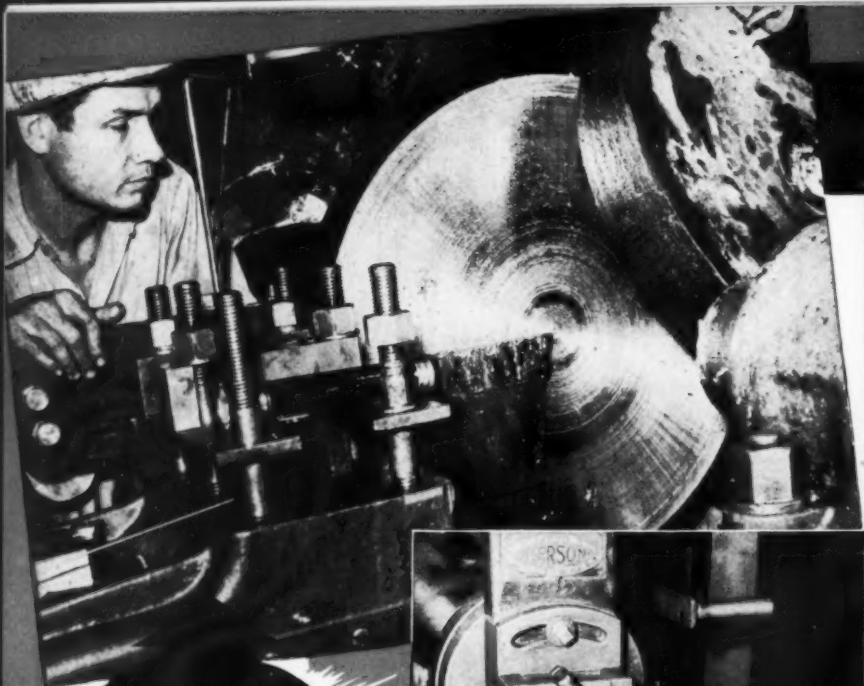
1144 BODY STREET, PROVIDENCE 1, RHODE ISLAND

You can set the Testmaster Indicator at any angle—
down in a hole, sideways,
or close up to the bracket



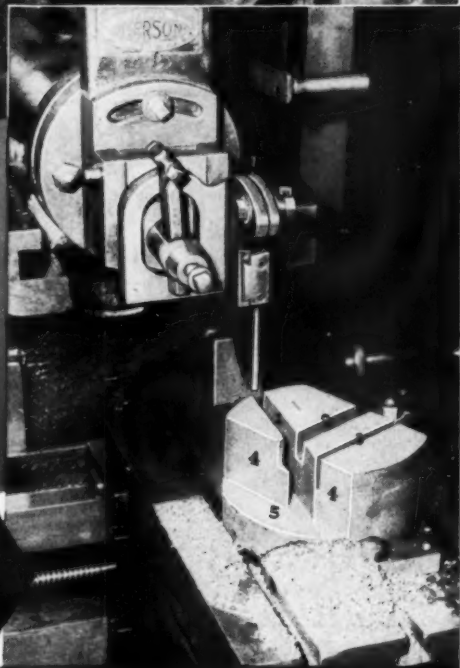
FEDERAL

PRECISION MEASURING INSTRUMENTS



In a Shipbuilding plant, the Anthony E-30 tool with standard 7/16" thick cutter blade, cut off this 27" diameter solid flange of ship propeller shaft in exactly 2 hours time, using power feed. Blade was not reground once during the entire operation.

Invaluable for deep slitting or cutting off flat stock . . . for making rigs and fixtures. Anthony Cutting-Off, Engine Lathe Tools, can be used in a Shaper as easily as in a Lathe. Saves your milling machine for needed work. Photo shows five different cuts in making a rig.



AMAZING! SENSATIONAL! REVOLUTIONARY!

These are some of the comments from men on the production line using Anthony Cutting-Off Tools. Unbelievable speed and economy in cutting-off and slitting operations are being accomplished every day by critical operators who thought it couldn't be done.

Here are a few examples of what Anthony Cutting-Off Tools are doing on tough jobs . . .

- . . . cutting off 7" diameter 2330 steel in a little over 3 minutes.
- . . . cut off 5½" diameter nickel steel bar in 6 minutes; a good power saw was taking 20 minutes.
- . . . a 10" bar of nickel steel was cut off in 14 minutes.
- . . . one user reports 1450 cut-offs of nickel steel of 1½" diameter made with one blade ⅛" thick.

Anthony Cutting-Off Tools will handle large diameter cut-offs as easy as facing, and as safe. Turret lathe tools cut off to 12" diameter. Engine lathe tools cut off to 40" diameter. You can do your cutting-off right in the lathe, where you want it, when you want it. If your lathe can chuck it, Anthony Tools can cut it off quickly, and safely. If you have a special cutting-off problem . . . consult us. We can design a tool to do the job.

Adapted to fit the largest boring mills, they cut horizontally at amazing speed . . . saving time and materials. On shapers or planers Anthony Tools will make deep slitting cuts quickly, safely and cheaply. Anthony Tools save money on every operation.

ANTHONY CUTTING-OFF TOOLS



Make one straight cut, flush with face of chuck. No wasteful V-shape cut that requires refacing. Save time and material.

Supporting blade gives added strength to cutter. Pivoting Trunion and Safety Slip prevent blade breakage, damage to material or chuck, and injury to operator.

By tilting blade upward to lathe center, top rake may be obtained at desired angle without grinding top of blade.

Trunion and Slip permit quick adjustment on lathe center. Blades are removed easily

for regrinding without disturbing the set-up.

Tool holders last indefinitely, only small H.S. Steel cutter blade is used up. Small, supported blade positively does not break off.

Thin, narrow cutting blades, made possible by the patented blade support permit fast, economical cutting of large diameter stock. The supported blade permits heavy feed even in cutting square or hexagon stock.

Until recently our entire production of tools has been taken by defense industries. The reputation of Anthony Cutting-Off Tools has spread on performance alone. Increased production facilities now makes these tools available to industry. Write for illustrated folder B.

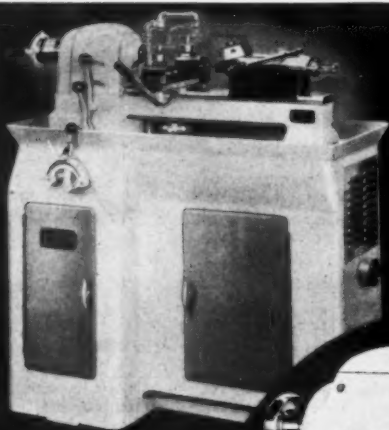
A few territories are still available for progressive representatives.

ENGINE LATHES

TURRET LATHES

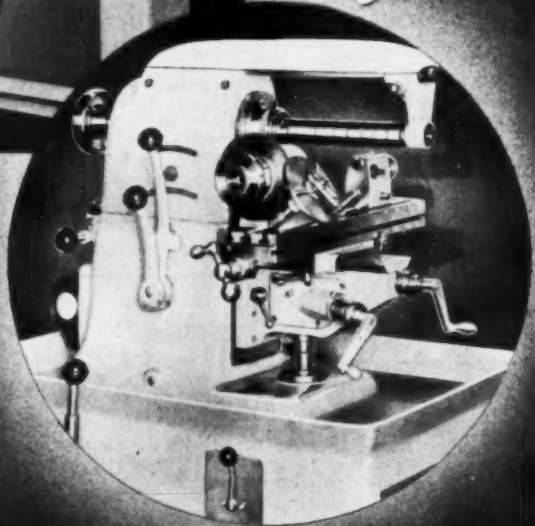
ANTHONY TOOL COMPANY

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**PRECISION HAND
SCREW MACHINE**

**BENCH
MILLING MACHINE**



Elgin's contribution to America's all out War Effort includes Bench Milling Machines, Hand Screw Machines, Bench Lathes — all high precision machine tools essential for the multitude of fine precision operations entailed by War Industries.

Elgin precision tools possess mechanical advantages and refinements that permit fast and accurate work to close tolerances plus sturdiness and all-round dependability. Sustained accuracy is assured by adequate design and scrupulous care in construction.

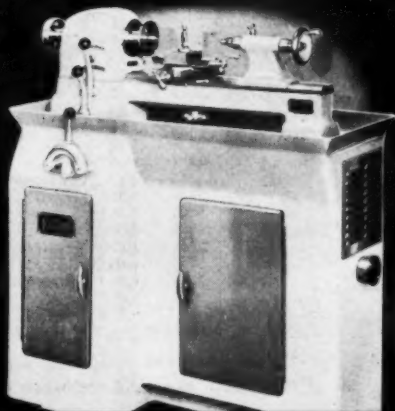
ELGIN TOOL
1773 BERTEAU AVE. AT RAVENS

PRECISION MACHINES



VERTICAL MILLING MACHINE

PRECISION BENCH LATHE

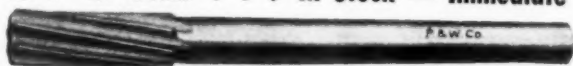


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P & W H.S., S.S. MACHINE REAMERS

1/16" to 1" by 64ths . . . In Stock — Immediate Delivery



1/16 Straight Flute.....	.063	\$1.76	13/32 Spiral Flute.....	.4067	\$2.35
5/64 " ".....	.0785	1.76	27/64 " ".....	.4223	3.76
	.0778	1.76	7/16 " ".....	.4380	2.35
3/32 " ".....	.0952	1.76	29/64 " ".....	.4536	4.20
	.0973	1.76	15/32 " ".....	.4692	2.63
7/64 " ".....	.1097	1.76	31/64 " ".....	.4848	4.20
	.1085	1.76	1/2 " ".....	.4955	2.63
	.110	1.76	33/64 " ".....	.5161	4.64
1/8 " ".....	.1248	1.10	17/32 " ".....	.5317	2.90
1/8 " ".....	.1265	1.76	35/64 " ".....	.5473	4.64
	.1277	1.76	9/16 " ".....	.563	2.90
	.127	1.76	37/64 " ".....	.5786	5.08
	.129	1.76	19/32 " ".....	.5942	3.18
9/64 Spiral Flute.....	.1410	2.20	39/64 " ".....	.6098	5.08
11/64 " ".....	.1722	2.20	5/8 " ".....	.6255	3.18
3/16 " ".....	.1847	1.38	41/64 " ".....	.6411	5.52
	.187	1.38	21/32 " ".....	.6567	3.45
	.1889	1.38	43/64 " ".....	.6723	5.52
	.1960	1.38	11/16 " ".....	.688	3.45
13/64 " ".....	.2036	2.64	45/64 " ".....	.7036	5.96
7/32 " ".....	.2192	1.65	23/32 " ".....	.7192	3.73
15/64 " ".....	.2365	2.64	47/64 " ".....	.7348	5.96
1/4 " ".....	.2495	1.65	3/4 " ".....	.7505	3.73
1/4 " ".....	.2505	1.65	49/64 " ".....	.7661	6.40
17/64 " ".....	.2661	2.88	25/32 " ".....	.7817	4.00
9/32 " ".....	.2817	1.80	51/64 " ".....	.7973	6.40
19/64 " ".....	.2973	2.88	13/16 " ".....	.8130	4.00
5/16 " ".....	.3115	1.80	53/64 " ".....	.8287	7.04
5/16 " ".....	.3130	1.80	27/32 " ".....	.8443	4.40
	.3153	1.80	55/64 " ".....	.8599	7.04
21/64 " ".....	.3286	3.32	7/8 " ".....	.8755	4.40
	.3320	3.32	57/64 " ".....	.8912	7.92
	.3326	3.32	29/32 " ".....	.9062	4.95
11/32 " ".....	.3442	2.08	59/64 " ".....	.9224	7.92
23/64 " ".....	.3598	3.32	15/16 " ".....	.9381	4.95
3/8 " ".....	.3745	2.08	61/64 " ".....	.9537	8.80
3/8 " ".....	.3755	2.08	31/32 " ".....	.9693	5.50
25/64 " ".....	.3911	3.76	63/64 " ".....	.9849	8.80
			1" ".....	1.006	5.50

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Priorities Must Accompany All Orders

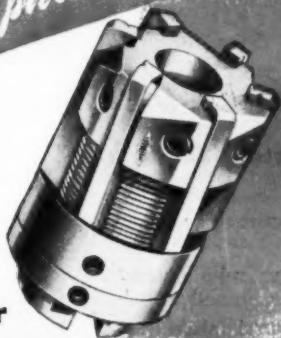
CENTER TOOL Machine Shop Equipment

CO. 153 CENTRE STREET, N.Y.

We carry a complete line of H.S. Drills, Milling Cutters, Lathe Tools, H.S. & C.S. Taps & Dies, Drill Chucks, Lathe Chucks, Files, Special Taps & Dies

WETMORE adjustable blade **REAMERS**

For low cost precision holes...



**Wetmore type
7 shell reamer**

and finer finish . . . faster

• Wetmore shell reamers are modern tools—precision built for precision work. They have the exclusive Wetmore features that assure top production, finer finish and economy of long tool life. Wetmore shell reamers are available in sizes from 1-1/4" to 6" cutting diameters, with right or left hand angle blades in carbide or high speed steel.

When the job requires precision reaming, high production and low cost—it's an ideal job for Wetmore tools. That is why they are widely used in so many top-flight metal working plants.

Send for the New Wetmore Tool Guide—it is full of data, information and specifications. Free to executives and engineers.

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BAR TURNERS

*Are the logical answer to
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- ★ Will hold accuracy to within .0005".
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- ★ Retractable tool slide prevents marring the work on withdrawal.
- ★ Extra rigidity means accuracy and smoothness with heavy cuts and feeds.
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Three sizes.

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5/8" capacity	\$ 68.00
1" capacity	85.00
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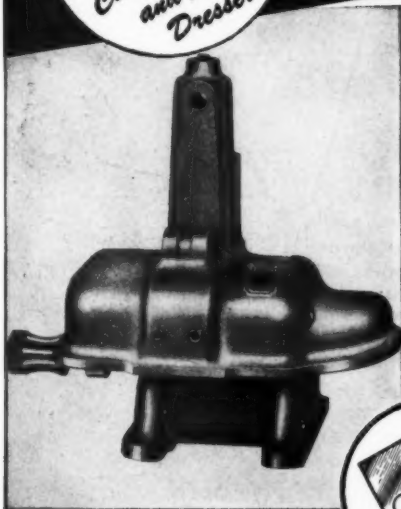
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Today machine shops must be equipped to grind odd-shaped forms. To do this precisely requires dressing the abrasive wheel to the desired contour. No. 41 does that, accurately, quickly.

*Introducing
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Contour, Radius
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Dresser*

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Now Even the Operator of Limited
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ABRASIVE WHEELS
Accurately and Quickly to
ANY CONTOUR!



No. 41-B Template Dresser. Rear View.

After the wheel is dressed by the chisel-pointed diamond, it fits the template accurately. When worn, it is quickly re-dressed to the same contour.

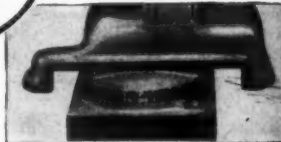
With its base, No. 41-A does all the usual jobs of a quality radius and angle dresser. Yet its cost is remarkably low.



Plus regular radius and angle Dressing

Virtually any desired contour can be generated on abrasive wheels by placing a template of the curve in the clamp of No. 41-B. A spring-activated plunger follows the contour of the template as the operator simply turns the knob. As he turns it, the chisel pointed diamond of the dresser moves across the face of the rotating abrasive wheel, dressing it exactly to the shape of the template.

Flexibility, accessibility of parts for cleaning, and simplicity are among the features of No. 41-A Radius and Angle Dresser made possible by expert engineering design.



No. 41-A Radius and Angle Dresser. Front View.

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HANDLES WIRE SIZE
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THE solenoid controlled Bellows Air Motor in the Electroaire Power Feed advances the drill, reamer or tap, at the touch of a foot switch, with perfectly controlled pressure and speed.

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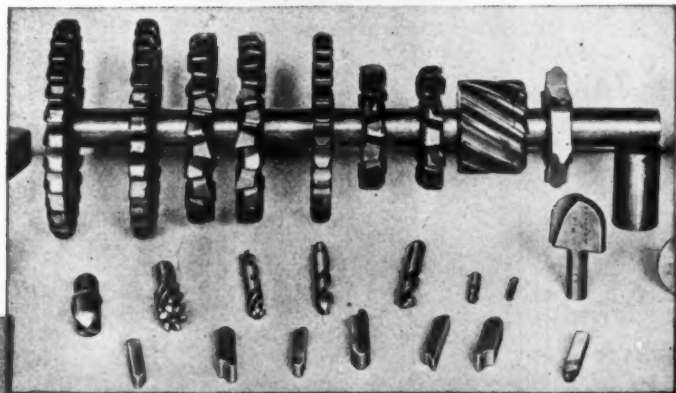
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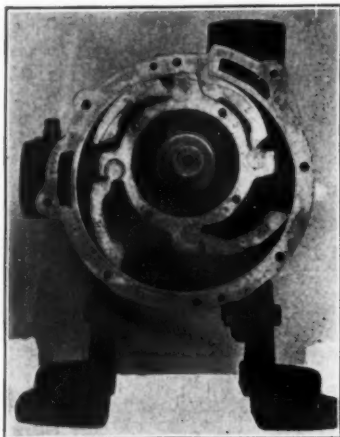
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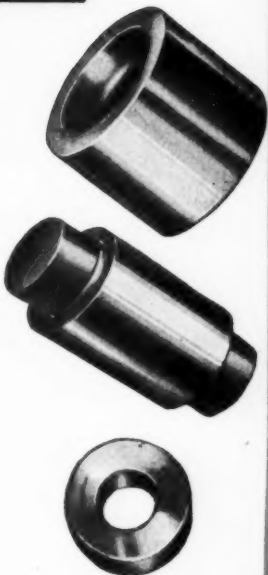
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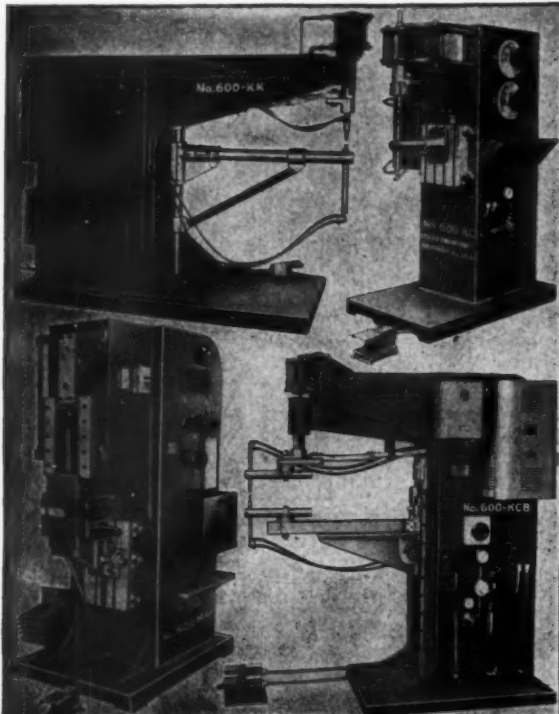
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Straight type grinder
was slow on maneuvering
into corners.



RIGHT TOOL

CONE WHEEL CLEANS UP
CASTINGS **25%** FASTER

STRAIGHT type 6000 R.P.M. Air grinders with 6-inch wheels were the rule in this foundry. Then came a lot of small castings with hard-to-get-at spots to be cleaned. Production wasn't anything to write home about. So they called in the Rotor Application Engineer for a bull's-eye analysis.

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AIR O'TOOL



THE

ROTOR TOOL

CO.

CLEVELAND, OHIO



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Model "01" accurate within
.0005 or less at the nose.



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.001 or less at the nose.

The Erickson Precision Collet Chuck is outstanding for its super gripping strength and ability to maintain accuracy.

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COLLAPSES $\frac{1}{32}$ " MAINTAINS GRIPPING
STRENGTH and ACCURACY

High speeds and heavy feeds may be used, as the 8 point grip and extreme accuracy of concentricity avoid vibration and loosening.

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An outstanding new development. Send for information covering this chuck for your tapping operations

ERICKSON CHUCKS ARE STANDARD EQUIPMENT ON MANY MODERN MACHINES

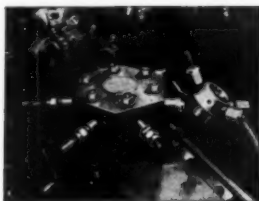
Leading manufacturers of newer equipment have been quick to recognize in the Erickson Chuck, a gripping means that adds to the accuracy and precision of their products. Inquire about Erickson Chucks for standard equipment.

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*mitting precision and accuracy
from the machine to the job* ★ ★



Model 201 High Speed Router Chuck with extended nose piece for pattern following.



Main and auxiliary turrets equipped with Erickson Chucks. Note short drill overhang, taps and reamers.



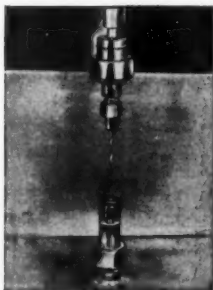
Model 102 Chuck—adapted for standard floating holder operations.



Vertical Milling operation with 101 Chuck.

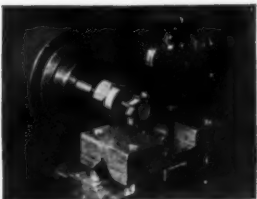


Models 102 and 402 Chucks in use on Automatic Screw Machine.



Model 301 Chuck adapted to quick change production operation on upper spindle. Note self-contained, interchangeable drill bushings in special nose piece on lower chuck.

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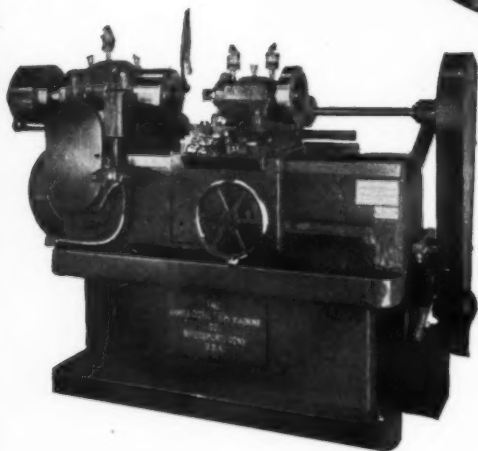


Horizontal Miller with 102 Chuck used to hold Woodruff Key Cutter.

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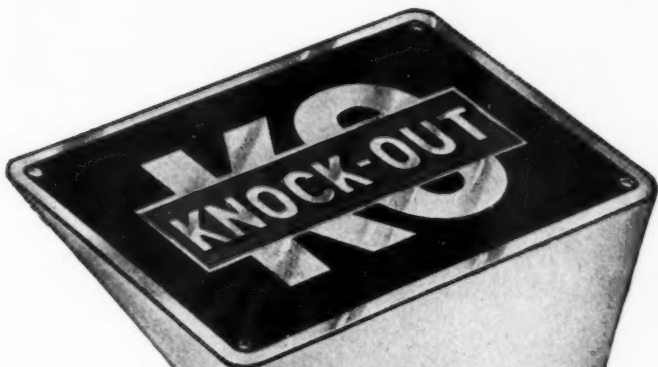
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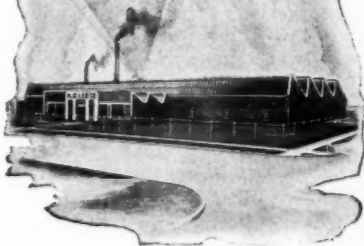


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believe in signs
... sometimes !!*

We're mighty proud of the one pictured above. It is not only our stamp of a job well done, but is your assurance of well engineered, well constructed machine tools.

We are currently in production on the following products:

Universal Tool Grinder
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Reamer Drives
Abrasive Wheel Dressers
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Literature on any or all products will be gladly sent to you on request.

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GRIPPING FORCE 15 TIMES AIR LINE PRESSURE!

America's war plants are switching to new, powerful Speedy Air Vises! From a single vise . . . to an installation of fifty . . . they are saving time, effort and labor costs! Air operated, *foot controlled*—both hands are left free for more rapid drilling, tapping, light milling, assembly, etc. **\$24**
Complete with Foot Control Valve, Air Hose and Fittings, only

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	<p>AIR REGULATOR Precision - built. Delivers pressures up to 140 lbs. With gauge, \$4. Less gauge, \$2.50</p>		<p>AIR FILTER Keeps water and particles out of the regulator and pneumatic tools. \$1.50</p>	<p>BLOW-GUN Looks and operates like a gun. Ideal for cleaning and blowing out chips, dust, filings, scraps, etc. . . \$2.50</p> 
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• Among other outstanding features, two are largely responsible for industry's unqualified acceptance of MODERN for general purpose, diversified threading work... wide threading range and unusual flexibility.

MODERN Self-opening Die Heads thread diameters from 1/8" to 7" in standard heads and up to 14" in special heads... accurately, fast, and economically. Their simplified design enables chasers to be changed quickly and easily. No

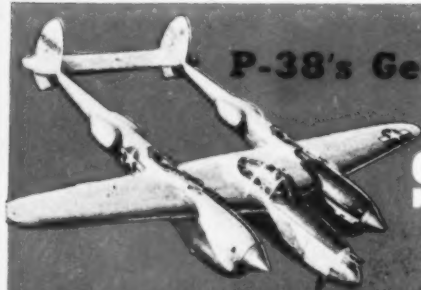
special tools or skill are necessary.

MODERN is prepared to take care of your die head requirements for small and large diameter threading... and do it with satisfying promptness. Standard die heads and standard size chasers can usually be shipped from stock.

Write us regarding your requirements, or send for Bulletin M-123. It gives full information on MODERN Self-opening Die Heads.

MODERN TOOL WORKS

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P-38's Get Wings *Sooner*
when
SKILSAW
is on the job!



Weber Showcase & Fixture Co., of Los Angeles, sub-contractor to Lockheed, uses SKILSAW Model "825" for fast, accurate skin splitting before applying reinforcing members to leading edge of wing sections for famous P-38's.

● Here's another example of how war production speeds up when smart engineers put SKILSAW to work. Fast, accurate skin splitting was a tough problem at Weber Showcase & Fixture Co.—until Weber Engineers solved it by putting SKILSAW Model "825" into a specially designed jig. Now, wings for P-38's roll off the assembly line faster, because SKILSAW is saving *time* and *manpower* on an important step in production.

Industry everywhere has found that SKILSAW is a most efficient cutting tool, with or without a jig. SKILSAW is powerful, compact, light in weight, easy to use . . . goes

right to the work, saves steps, saves material handling.

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PLANNING FOR AFTER-THE-WAR?
Let SkilSaw Field Engineers help you now to plan "looking-up" for peacetime production with SkilSaw's new post-war tools.



Featured In This Issue

TOOLS, JIGS, AND FIXTURES of many ingenious forms and types have been important factors in our war production. Naturally some of the most interesting of these have been developed in the fast-moving aviation industry. Gerald Eldridge Stedman visited the Texas Division plants of North American Aviation at Dallas recently and tells about some of the things he saw. These plants are producing P-51 Mustangs, AP-6 Texas Combat Trainers, and B-24 Liberators, so an unusually wide range of manufacturing equipment is needed. The story commences on page.....129

TYPICAL MILLING JOBS are analyzed and discussed in a continuation of Dr. Frommelt's series of articles on Milling Fundamentals. Consideration of these applications will help to generate constructive thinking on the important subject of milling procedure. Variations of the many jobs described will be of aid in solving related problems in milling technique. See page.....158

ELECTRONICS promises to ease many tasks and lighten many burdens in the post-war world. Perhaps some of the predictions have been fanciful, but that is often the case in press-agenting new ideas. It is reassuring tho to read about successful applications of Electronics. P. D. Aird tells how Ford is using Electronic Drilling Control to speed crank case production for aviation motors in the story commencing on page.....199

IDEAS can be wasted and the loss is just as serious as in the case of misused man-power, machines, and materials. Mr. Mottershead gives some worthwhile suggestions for idea conservation in the article commencing on page.....213

INVESTED CAPITOL is the subject of Arthur Robert's current contribution to the tax problem department. He brings out several new angles and gives a number of

helpful suggestions in the article commencing on page.....228

TINY SCREWS may be troublesome sometimes in complicated assemblies. Carleton Cleveland presents one solution to the problem of handling little screws quickly and surely, in the story commencing on page.....241

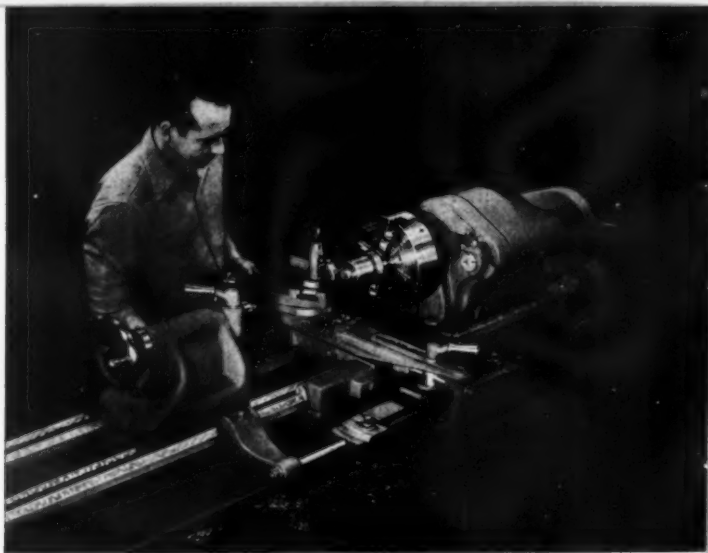
LOW COST TOOLS don't always require elaborate drawings. At General Electric, these tools are frequently constructed by skilled mechanics from impromptu sketches or verbal instructions. The savings in time and labor are obvious as explained by W. J. Curry in the story commencing on page.....252

"LET'S TALK SHOP" presents answers to the series of questions published in July. These questions are intended to help in determining the skill, experience, and mechanical aptitude of prospective shop mechanics. Other interesting articles include a gear assembling fixture; a special filing machine; a chisel for removing excess metal from welds; adjustable facing cutters; a method of salvaging die castings; a contour gauge; a setup for drilling holes in structural angles; a new induction silver brazing application, etc. This section starts on page263

WHAT'S NEW introduces the monthly parade of innovations in tools, equipment and methods. Included is a new Mattison Precision Vertical Spindle Grinder; a new Colonial Broach Sharpener; a special Snyder machine for milling air craft pistons; a new vacuum test pit for impellers used by Buffalo Forge Co.; Sundstrand Bench Centers; a Speed Clamp; a new Ingersoll wall chart showing how to sharpen milling cutters etc. This section starts on page.....294

MILLING CUTTERS of three interesting new types are discussed in the Trend Department commencing on page.....352

MECHANICS Thru the Ages, page 412



Precision —

THE DISTINGUISHING QUALITY OF SOUTH BEND LATHES

It is for their high precision that South Bend Lathes are best known. Their dependable accuracy has made them first choice for the most exacting work in hundreds of essential war production plants. Finish turning and boring operations are often performed with such exactness that subsequent grinding, honing, or lapping is unnecessary.

In war production, there is no place for equipment that can not hold required tolerances or deliver maximum output. Investigate the possibilities of South

Bend Lathes for handling your exacting jobs with greater efficiency. With them, you will find it easier to maintain precision tolerances on toolroom and production operations.

POST-WAR PRIORITY PLAN

To those who cannot qualify for a war-time priority, South Bend Lathe Works offers a practical Post-War Priority Plan. You can place your order now for any South Bend Lathe. No deposit or down payment is required. We ask only that the order be placed in good faith. When civilian production is resumed, orders will be filled in the sequence established by the numbers of the Post-War Priority Certificates. Should conditions require, the order may be cancelled at any time.



BUY WAR BONDS NOW... SAVE FOR LATHES

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 37 YEARS • SOUTH BEND 22, INDIANA

AS THE
Editor
SEES IT



Hitler's "Buzz-Bomb" robots have caused civilian casualties and considerable property damage in southern England. The course of the war might have been altered had the robots been used in the battle of Britain. The principal effect they will have now will be to harden allied hearts and to make it tougher for Germany in the peace negotiations.

For the future, tho, there is a sobering thought in the terrific destructive force which might be built into larger robot bombs. Some minor power could secretly prepare to obliterate an enemy without risking pilots or costly planes. There would be no need for mobilization, no army transport or supply problems. Indeed warfare of the future becomes increasingly complex and terrifying with the development of greater and more violent engines of destruction.

One thing we certainly cannot afford to do is to settle back into complacency after V-Day and permit Germany to prepare for world War III. Back in 1938, Adolph Hitler wrote:

"A defeated nation can even better than a victorious nation, be trained and prepared for the day of final victory. It may happen that I cannot win victory at once in this coming war; we may be forced to interrupt it. Then we all will be back under ground. We will

smile, we will look, we will wait. But after some years when the weak, inefficient democracies will have utterly failed to solve the world's post-war problems, then we will suddenly break loose from under ground and our stupefied enemies will discover too late that millions of their own youth, misguided by weak education, disappointed by democracies' failure, will be on our side. Victory in this third world war will be quick and easy. It will be in our pocket like a ripe apple we take from the falling tree of democracy."

After such a challenge it would be down right foolhardy if we give Germany any possible chance to prepare for still another war.

* * *

A full scale, three-front war is tightening the vise on Germany. Japan has lost much of her vital shipping and a heavy slice of her navy. Her inner defense perimeter is being penetrated. It seems reasonable to hope that the end of this war is in sight. One thing tho can delay victory. If any of us on the home front—war plant workers, employers, farmers or public servants—slow down the pace set after Pearl Harbor, it will mean extra days of fighting and heavier casualty lists. Dig down and see if you cannot buy another War Bond today.

Wesley G. Paulson

Do You dare **cut inventories** ?



Here is a safe method . . . that works!

Out of the maze of talk and conflicting statements regarding war contract cancellations and cutbacks—it seems reasonable to conclude that no large-scale production curtailment is expected until after the successful invasion of Europe is an accomplished fact. However, ordnance schedules are constantly being adjusted on account of changing needs and improved designs. This has resulted in recent cutbacks for many metal-working plants. Also, reserve stocks of certain war material have already reached a point where it has been found advisable to cancel further deliveries.

Due to this situation, many manufacturers may overnight be confronted with the task of disposing of steel overstocks. Too often these stocks are not easily converted to other production uses. A valued inventory can quickly become a white elephant.

We urge you to try to avoid this loss. Keep your inventory at a practical working level without excessive reserves. We believe this is entirely safe and practical today—and can be

done without incurring undue risk to continuous production. There was a time when warehouse stocks were in rather bad shape and manufacturers, in self-defense, built up high steel inventories. But the WPB has seen the folly of each company carrying big inventories to meet all eventualities, and has permitted a reasonable build-up of general warehouse stocks, which serve everyone. Thus the overall tonnage of idle steel may be reduced, and the cutback and cancellation blows are cushioned.

Stocks of most steel distributors are in good shape to meet all reasonable demands. Reliable trade sources report that these warehouse stocks are now more than 100% over the low of 1942. Ryerson, in particular, has large and complete stocks of bars, shapes, plates, sheets, stainless steel, alloys, tubing and other vital steel products—ready for immediate shipment. Call any one of the eleven conveniently-located Ryerson steel-service plants for your day-to-day or emergency steel requirements.

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TOOLS JIGS and FIXTURES



at NORTH AMERICAN AVIATION

By GERALD ELDRIDGE STEDMAN

IT is because North American Aviation, Inc., produces three drastically different military aircraft at its two adjoining Texas Division plants at Dallas that I found the diversity of operations unexampled among my 224 plant contacts thruout the country so far made since Pearl Harbor. An article could be written, merely listing the advanced practices, innovations and N.A.A. originations that here abound.

Induction brazing, negative rake cutting, artificial aging of aluminum alloys,

belled conveyor station signals, injection molding of phenol furfural, radial routing, a variety of advanced stretching operations, high speed milling, magnesium machining, synonymous gang drilling of 69 holes perpendicular to changing contour, blank-form-flange-and-return-flange all in one forming operation . . . no use, all cannot be mentioned. But the production of P-51 Mustang, AT-6 Texan combat trainer and B-24 Liberator, all in virtually one plant, together with the fabrication of 97 per cent of its parts, exclusive of forgings and Government-furnished

An increase in production of approximately 150 per cent was gained thru use of this automatic, twin-spindle drilling machine. Designed to drill No. 80 (.0135") to 5/16" holes in stock 1/16" to 1" dia., the machine can and does handle a multitude of bolts and similar parts. The spindle speed and the feed are 100 per cent adjustable.





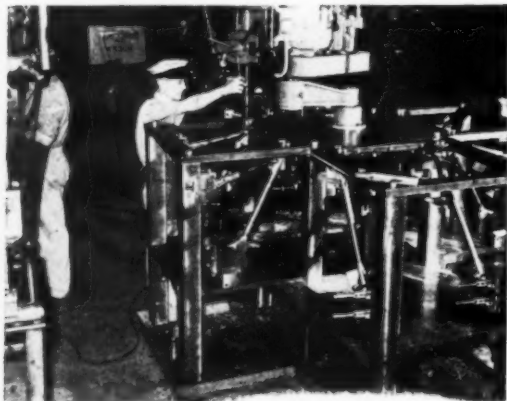
This hydraulic stringer stretcher used in the aluminum processing department, has 120,000 pounds of force harnessed in it. Stringers are cold worked by stretching to three per cent of length. Fully adjustable tail stock as well as interchangeable jaws makes possible the handling of all shapes and lengths of stringers used on the B-24 Liberator manufactured at the Dallas North American plants.

equipment, within that plant is certainly something to behold.

It is the purpose of this article to describe a very few of N.A.A. original designs in machine tools, jigs and fixtures

there existent . . . those observed in a swift plant observation.

A horizontal twin spindle drilling machine has upped production over five-fold, drilling bolt heads of all sizes. This



All B-24 Liberator turbo mounts, manufactured at the Texas Division are loaded in this four section drill fixture which incorporates a drill head of the same design as that used on motor mount fixtures. Continuous operation is provided by having one operator loading while the other does drilling, reaming and spotfacing.

At 3:32 A. M. Eastern War Time, June 6, 1944, the official announcement of the invasion of "Fortress Europe" was released by General Dwight D. Eisenhower.

rang months ago!

the alarm

It marked the opening of the second front — the greatest event of all time . . . the beginning of the end of the war. It sounded the alarm for management to wake up and definitely plan for peace.

To talk about post-war plans is not enough. Now is the time for actual, factual planning and doing if private enterprise is to survive. *The alarm rang months ago.*

Now is the time to plan your new installations of machine tools — to actually place your orders — to prepare for the day when you will have to supply more and more peacetime goods at lower cost.

LeBlond is making Tomorrow's Cost-Downing Lathes Today. A study of their exclusives and many other features will convince you that LeBlond's are the turning tools that belong in your "peace work" production program. Write today for your copy of LeBlond Lathe Bulletins. Use the coupon.

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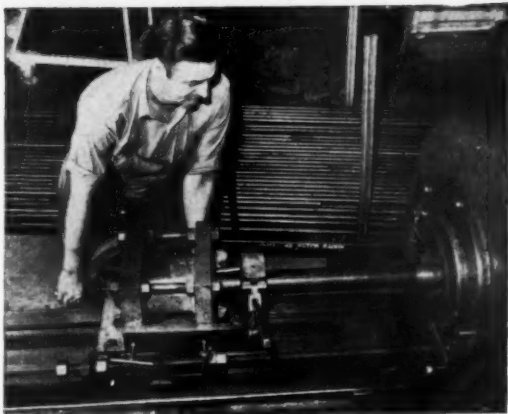
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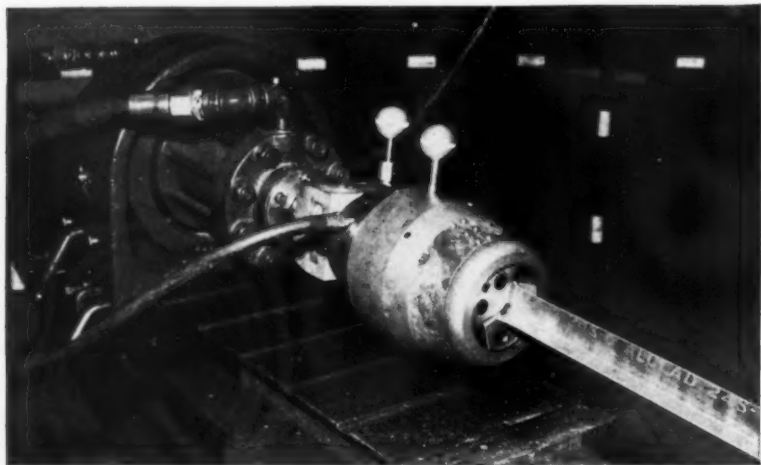
Today

Brute force was needed to swage Chrome-Moly tubing in this rotary swaging machine until the feeding attachment shown here was designed. The attachment, designed and made at the Texas Division, takes the fatigue out of an operation which formerly required four men.



is equipped with locational jig, the operator standing at the machine end and feeding with both hands. The machine has electric power to drill, air pressure

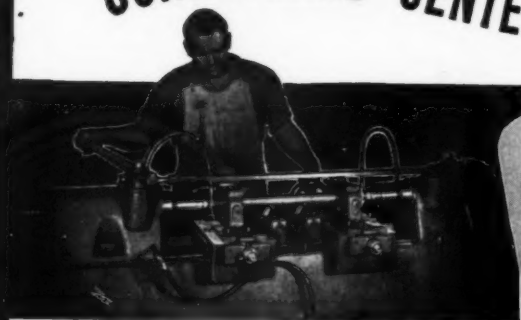
to feed and clamp. A standard gear box, driven by a variable two hp motor developing 54 to 3000 rpm accommodates two spindles, which, thru four universal



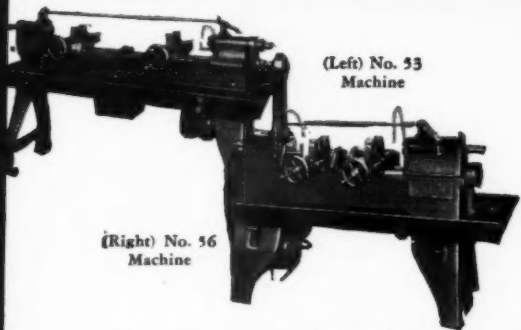
Circular shape of the pneumatic jaw adapter barrel used on stretching machines at the Texas Division, permits jaw pressure to be applied radially 60° apart. As many as six jaw segments may be used depending on the section to be clamped. This is to facilitate clamping of such sections as Tee, Box and many others that are usually difficult to clamp. Jaws are actuated by a pneumatic cylinder and valve, which are integral with the clamp. The adapter barrel is fastened to the cylinder assembly by a quarter-turn breach lock. This and a loading ring used to hold the jaws in position make changing of jaws simple and easy.

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...handle a
wide range of
CONVENTIONAL WORK
and
SPECIAL
APPLICATIONS



(Left) No. 53
Machine



(Right) No. 56
Machine

If not too complicated, special applications such as combined operations or machining of odd-shaped parts can also be handled by means of attachments and fixtures.

The capacities of the two machines are as follows:

The No. 53 Centering Machine will handle round or hexagonal stock from $\frac{1}{2}$ " to 4" in diameter. Two drills $\frac{1}{2}$ " or under can be used simultaneously in steel. The machine is made in two sizes—4" x 24" and 4" x 28".

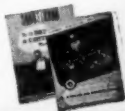
● If your work calls for accurate centering of one or both ends prior to other machining—if it is within $\frac{1}{2}$ " to 6" in diameter and up to 96" in length—it can be handled to advantage on Sundstrand Centering and Drilling Machines.

In work requiring only centering of simple parts, these machines offer ease and speed of handling, reduced production costs, and compact, space-saving construction.

The No. 56 Centering Machine can be used on work from $\frac{1}{2}$ " to 6" in diameter. Two 1" drills or under can be used simultaneously in steel. The machine is made in four sizes—6" x 24", 6" x 48", 6" x 72" and 6" x 96".

Send us a print of the job—specify the diameter and length of the workpiece. At no obligation, our engineers will determine what can be done, tooling methods available and the investment required.

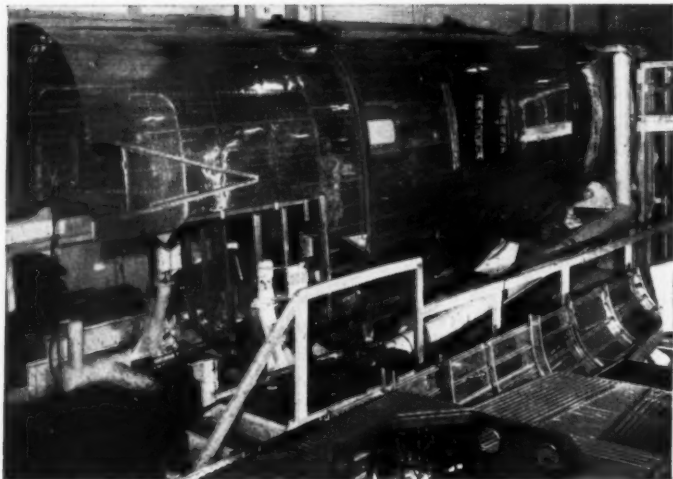
Free Additional Data is included in these two booklets. Write today for your copies—ask for Bulletins No. 53-1 and 56-1.



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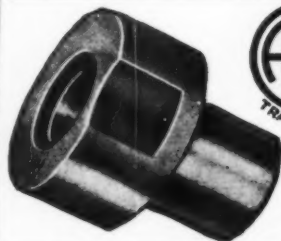


This illustrates use of the three-point suspension T-base structure in mating the three major assemblies of the after section of a B-24 Liberator fuselage at the Texas Division. All vertical support members transfer weight to this strongest of geometric shapes. By well planned design in regard to indexing, only the most critical and controlling points, simplicity was attained. This resulted in accessibility, low cycle time, minimum maintenance and small tooling cost.

joints, actuate twin drills. The chuck is stationary and the work feeds. The work movement on ways is controlled by air pressure and clamped individually by air. A reciprocating air valve gives the set of the stroke travel and retreat. A hydro-check (ball checked) oil valve controls the reciprocating wobble of the ram. The work travel is stopped by two arms on the stationary chuck. Lubrication is by

overhead tube which feeds in between the work on the Jacobs chuck. This has removable bushings to accommodate any size drill holes up to 7/16". Air clamps carry 500 lbs pressure. N.A.A. makes extensive use of hydraulics thruout its huge machine shop for work-holding purposes.

N.A.A. uses arc welded tubular construction in the fuselage and motor mount construction of its Texan combat trainer.



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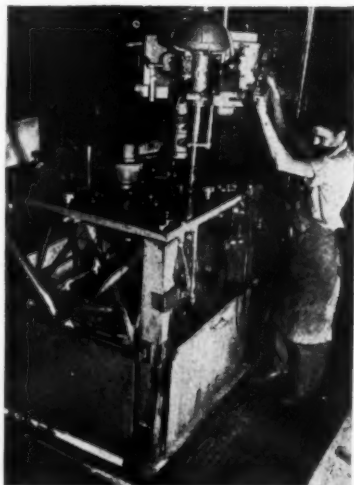


**UNIVERSAL ENGINEERING
FRANKENMUTH,
MICHIGAN**



Many of these assembly pieces have to be swedged. This upset forging is accommodated by a rack and pinion jig on a swedging machine which feeds the work into the die. Expanding dies revolve and hit together to accomplish the hot swedging action. The jig carries a locating device. An automatic air trick cleans the considerable scale from this work. A photograph is shown.

An interesting example of effective jigging is that used to accommodate drilling, reaming and spotfacing of the B-24 motor mount support. The radial arms of this jig are cast from grey iron. The column is supported by Timken bearings. Holes of 1" to 1.75" diameter are reamed to a .002" tolerance. A Walker-Turner 4-pulley, speed reducing drive is employed. Adjustable sleeves on the cutting tool accommodate the spotfacing operation. An overall tolerance of .010" is ef-



Fifty-six operations are performed in this drill fixture, on both ends of the engine mount of a B-24 Liberator manufactured at the Texas Division. Tools are held in a special quick change chuck and variable spindle speeds are provided by a special geared transmission added to this converted, radially mounted, Walker-Turner drill.

FORMULA FOR GOOD WORK

"How do you mix your paints?" inquired an admirer of the colorful work of a famous painter. "With brains," was the artist's crisp reply.

The combination of "know how" and good tools is an equally effective formula in the industrial sense. The machinist below, assigned to an exacting job in a vital war plant, offers an example. Armed with Nicholson Files and his years of experience, his production is high, his work precise, his rejects few.

Nicholson Files are designed toward the ultimate aim of every manufacturing management: *maximum production of a satisfactory product with minimum waste*. Precision-shaped, precision-cut, precision-hardened, these world-famous files come to you in such uniformly high quality that we can safely guarantee you *Twelve perfect files in every dozen*.

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A detailed illustration of a machinist, shown in profile, wearing a cap and glasses, focused on his work. He is using a large Nicholson file to shape a metal part on a workbench. Various other tools and components are visible on the workbench. The background is a simple, stylized landscape with a wavy horizon line.

NICHOLSON
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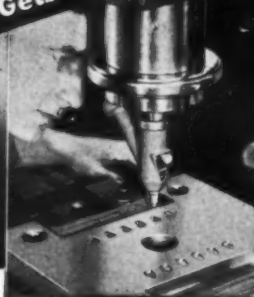
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There was a time when the wiggler was considered "tops" for positioning a machine tool spindle. BUT, THAT'S NOT TRUE ANY MORE.

The Center Scope is now the fastest method for accurate centering of a machine tool spindle. It has a trimming screw to compensate for spindle run-out, which European-made microscopes do not have. 45X magnification makes it easy to work to tenths.

As a top-flight mechanic, you should own a Center Scope—or, if you feel that the boss should buy one, put the bee on him.

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fected. There are three such jigs with one pump unit for lubricant.

A further expression of this jig design is used to drill, ream and spotface the upper motor mount support. This is a collection of four jigs around a central column, each carrying differently dimensioned work, all of which must mate on final assembly. The two pairs, right and left, of the work are made ready in rotation on this jig which has upped production over 50 per cent and saved a considerable number of manhours. Photographs illustrate the jiggling principle of both setups.

A tremendous amount of cable in a variation of lengths is required in air-frame construction, each inch of which must be tested. A hydraulic cable proof loader for this cable testing operation was developed which now tests upwards of 3000 cables per day in two work shifts, providing recorded stretch proof of each cable under a test 60 per cent above breaking strength, which is held for five seconds. This apparatus paid out in 60 days, and increased production six fold, avoiding all needless scrap. It has absolute pressure control and the design has eliminated all bolts, nuts and make-shifts. Adapters of its universal chuck accommodate all cable sizes. Other such testing apparatus elsewhere observed usually requires a stock of from 50 to 100 adapters which must be changed to accommodate each stretch. By simple adjustment, made in a fraction of a minute, this N.A.A. design accommodates all.

Main features of the proof loader are its remote control, weight adjustment to control stretch, safety fence, visual stretch-duration signal, and individual stretch control. An important feature is the four cylinder hydraulic system which saddles eight cylinders, having bell crank chucks which accommodate cable sizes from $\frac{1}{8}$ " to 5/16". A tail holder travels on 26 foot ways, adjustable by bayonet lock, calibrated in 6" spaces, the work being anchored in it by a coining principle. The middle way is chrome plated because heat treatment would cause warp. Alignment must be forever true in such stretch proofing. The cable barrels with their universal chucks are housed in barrels operated directly from chrome-plated hydraulic cylinders, two cables being

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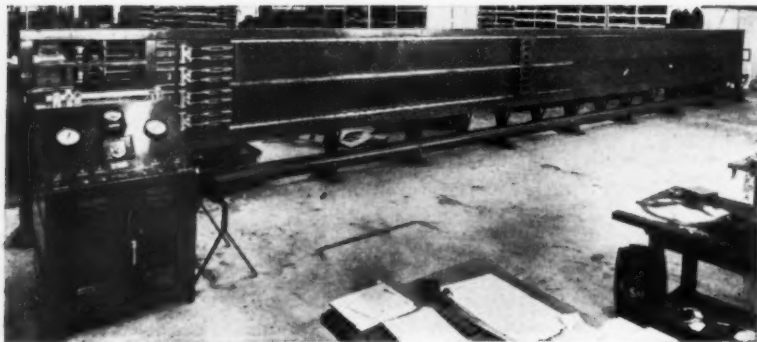
No more engineering time and charges! Deliveries shortened to a matter of days. Interchangeability of spindles and components enables adoption of complete air gaging program at minimum cost and minimum gage inventory.

No more GO and NO GO checking of internal diameters. Both tolerance limits are checked in one pass faster than either could be checked with a plug gage. Frequent, time-consuming and therefore costly, inspections of gages are eliminated. Precisionaire spindles outlast plug gages 10 to 40 times.

No more human element of error when you use the Precisionaire. Parts with tolerances ranging from .005" to fractions of .0001" can be checked quickly by unskilled and untrained operators who merely present the gage to the part or vice versa.



WRITE for Engineering Data No. 12 detailing STANDARDS and also showing SPECIAL applications.



An increase in production approximating 10-times was realized in the cable department when this automatic proof-loader went into operation. The test cycle is 100 per cent automatic, requiring operator only to load, start and unload. A universal chuck permits the testing of all cables used on the three planes built at the Dallas plants—P-51 Mustangs, B-24 Liberators and AT-6 Texans—without the use of bolts, nuts or special adapters. Adjustable tail shocks permit the testing of any length cable up to 44 feet.

stretched from one hydraulic cylinder by the straddle arm rigging. The weight adjustment to control the stretch load per

cable size is a feature of remote control outside the safety fence. This panel carries test pressure gauges, timer, switch



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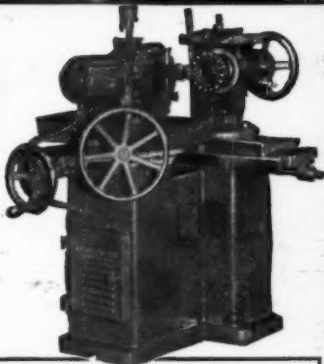
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buttons to operate each hydraulic cylinder individually if desired, with a red light flash which stays on during the required test interval. This is perhaps one of the most important testing facilities in aviation assembly.

Built in 120 days, the original Dallas N.A.A. plant began producing in April 1941, and among other activities, by early 1944, the production of 10,000 Texan trainers in the Dallas Plant "A" alone had been announced. The Texan combat train-

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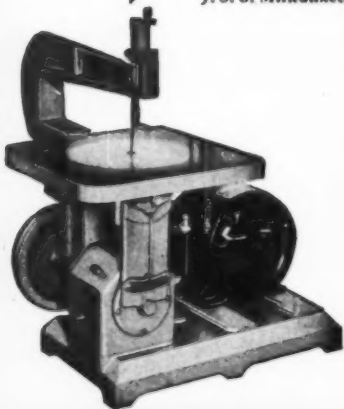
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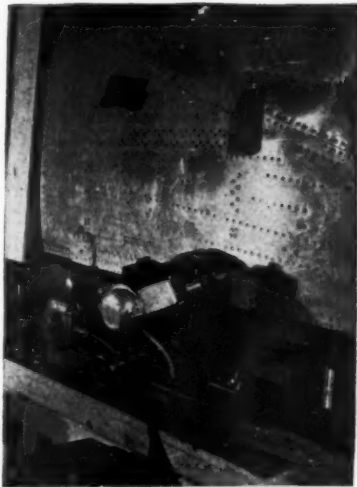
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er is a direct descendant of the NA-16, first N.A.A. designed plane. It is used by A.A.F., U.S.N., and the British. Of less than 100 men who came from the company's main Inglewood plant to start the Texas Division operations, one was Walter F. Thies, superintendent of tooling, who now has pattern shops (wood, metal and plastics), tool design, foundry, tool making and experimental tooling under his direction, with an organization under him that numbers thousands in itself. Constantly stimulated by Harold F. Schwedes, Division Manager (unusually inventive tool designer himself), Thies and his staff tackle every problem, even refining the many suggestions of NAA war workers (who have done such a good suggestion job that NAA ranks fifth in WPB awards).



This high cycle milling machine delivers 19,000 sfm at the cutter bits. Eight aluminum engine mount pads are machined to exact assembly dimensions in one of the fastest operations of its kind in the industry. The machine is set to CVAC interchangeability masters with a micrometer adjustment.

Another unique piece of apparatus of N.A.A. design washes, cleans, burrs aluminum sheet in one progressive automatic

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A Typical HIGH PRODUCTION Profiling Job—done on the Gorton 9-J Duplicator. 10 elliptical wells—no two the same size—on each of these cylindrical work pieces are rough and finish milled, with beveled edges—simply by combination of Tracer Control, with Automatic Rotation of work and master, geared to table movement—all controlled by one central lever motion.

Blank cylinders come to the Gorton Duplicator, finish-turned. The 10 wells are first rough milled to a depth of .052". Then a finish cut, with the same cutter and spindle speed, removes .010" merely by lowering spindle the required amount. Hand finishing required is almost negligible—due to the excellent finish obtained by the use of 2-flute Tungsten Carbide form cutters—at Gorton high spindle speeds.

PRODUCTION DATA

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Operation—Rough and Finish Milling of 10 Wells (varying from $\frac{3}{4}$ " wide x $\frac{3}{4}$ " long, to $\frac{1}{2}$ " wide x 2" long). .062" deep.
Cylinders— $9\frac{1}{16}$ " O.D. x $7\frac{1}{2}$ " long.
Feed—Manual Spindle Speed—4,000 r.p.m.
Tolerances— $\pm .005$ "
Time—Roughing 18 minutes; finishing 23 minutes; total floor-to-floor, 43 minutes. (10 wells complete, average 4.3 min. per well.)

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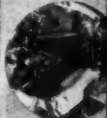
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operation and in any dimension up to 26' long, 48" wide. The work enters the 175° F hot washer, having eight roller brushes, specially designed to eliminate scratch hazard. It progresses to four rubber wringer rolls and by endless conveyor to the burring machine which is

equipped with a properly weighted roll that forms a radius on the sheet end, burr removal being by two air cylinders connected to the top roll which is adjustable by a micrometric setting located on the cylinder top. Work is removed by gloved handlers.

Radii are eliminated on this washing, drying and burr rolling machine. Micrometers permit the setting of burring rolls to the thickness of sheet stock. This setting is maintained by 8" air cylinders attached to the top rolls.

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This handy compact, portable unit is popular in shops and laboratories for heat-treating and many other jobs. Expertly designed and built, "it's a lot of furnace for a low cost." Write for details today.

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\$42.50

(Complete for 115 volts)
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Heat Range—low, medium, high, booster. Continuous operation to 1500°F. Intermittent to 1850°. *Speedy*

Indicating Pyrometer—calibrated in Fah. and Cent. Aids temperature control, assures uniform results.

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Their guns speak a lingo even you can understand.

DON'T COUNT ON A LUCKY BREAK like one of those guns failing in an emergency, because the men of Uncle Sam's Navy don't take chances. **EVERY SHELL IS GAGED** to make sure it fits perfectly in the gun for which it was made.

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* * *

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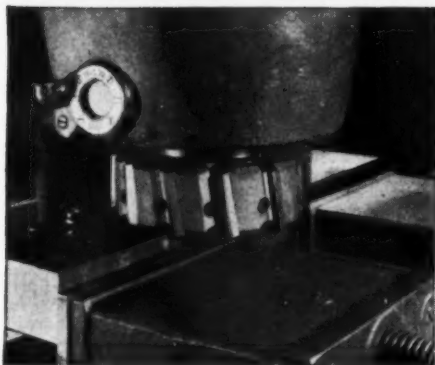
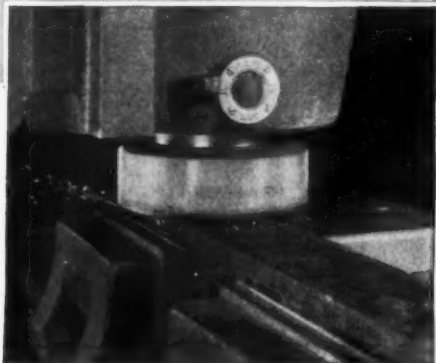
Manufacturers of "Quality" Products

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INGERSOLL

Negative Angle



CARBIDE-TIPPED CUTTERS

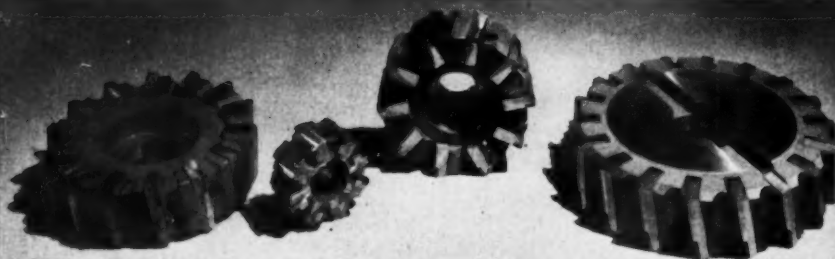
Negative angle cutters are no longer a fad. They represent a real advancement in steel milling practice. Removing 3/16" stock at 42 in./min. feed with mirror finish as illustrated is but one of many successful Ingersoll applications.

This process of milling steel with carbide is not a cure-all. It must be applied only under very rigid conditions of both machine and fixture. Results depend largely on the equipment used. We suggest that you purchase an Ingersoll negative angle cutter for experimenting on your work. This is the only way to fully appreciate the possibilities of higher feeds and longer tool life with high polished finish.

Standard Ingersoll negative angle cutters are listed below. Variations with different tooth spacing are available where conditions warrant.

CUTTER NO.	DIA.	TEETH	PRICE
98104X	4	6	\$46.00
98106X	6	8	52.00
98108X	8	12	70.00
98110X	10	14	95.00
98112X	12	16	115.00

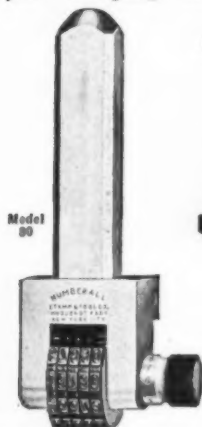
Send for a copy of "Ingersoll Engineering Specification Sheets" describing our complete line of standard inserted blade milling cutters.



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NUMBERING MACHINES for stamping into metal, etc.



Model 80
New, quick Set Machine. One wheel can be turned quickly by knurled knob for consecutive numbering.

Improved Type Holders. Hand or Press Style. Super Quality Steel Type.

Type is easily, quickly, loaded and unloaded. Simplest construction. A pin holds the type securely. No screws nor springs. Made in various sizes: 1/32" to 1 1/2" figures and letters.



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HUGUENOT PARK STATEN ISLAND 12, N. Y.



Model 45
Platform for stamping Name Plates and other small articles.

Made in 1 to 20 wheels. Stamp in perfect alignment. Shank for Hand or Press Stamping.

is the air chuck for the Hufford stretcher which holds the jaws for stretching of stringers and extrusions (N.A.A. originated at Inglewood, California). The stretch capacity is 50 tons. These chucks are adjustable to accommodate different jaw designs. The chuck is controlled by a four-way air valve and has two levers, one handling the opening of the jaws and knock-out of the work, the other closing them. The chuck is of chrome-molybdenum. The center of gravity was located on the jaws when designed. The jaws can be changed in less than five minutes. They are safety guarded with a frustrum cone.

Another important N.A.A. design is a 50 ton capacity stretching machine, 26' long, whose operating head features a Hannifin hydraulic cylinder with 9" bore and 10" stroke. A pilot valve is located ahead of the jaws and is used to shut off the pressure when the stretch is completed. Jaw housings are of cast steel and travel along ways. One jaw is attached to the cylinder and the other is controlled by a rack and pinion movement, calibrated to 6" spacing. The jaws operate on a 7° taper rigging which pulls in and locks, using same coining principle as in the stretch loader mentioned. This stretching of stringers is for work hardening after heat treat. The stretching machine is likewise used to give a 4 to 5° stretch to aluminum alloy bar stock as part of the technique in artificially aging rivets.

Each stringer has to be progressively symbolized to conform to A.A.F. requirements, a laborious job if accomplished by hand with symbols having to be stamped each 6". So N.A.A. has rigged up an automatic stamper. A roller printer is actuated in this design from an air cylinder cocked by built-up pressure. When the trigger is released, this shoots the roller to the other end of the stringer and is there ready for return stroke. The device travels on a monorail and is supported in a bank of four rollers, two top and bottom. The action is controlled by a pedal. This eliminates all hand printing of A.A.F. nomenclature.

Yet another N.A.A. Machine design, just being installed at the time of the plant visit being reported, is a beading and flaring machine. This will up production six times, reduce scrap, and elimi-

Making **SHORT** *work of Long turns*



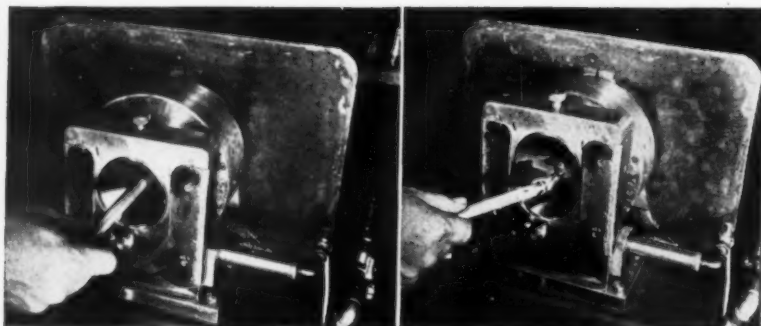
with
MAINTAINED ACCURACY

The exceptional performance of Kennametal on long cuts works miracles in steel-cutting shops where taper is a bug-a-boo that means, at the best, expensive reworking and finish grinding, and at the worst, a high rate of rejections. Kennametal contains a unique intermetallic compound (tungsten-titanium-carbide) that gives it unmatched hardness. Used properly, it can remove stock from the toughest steel up to $3\frac{1}{4}$ times more effectively than other carbides!

Our engineering staff knows and understands the amazing inherent characteristics of Kennametal and how best to apply them to any specific cutting job. There is an experienced field engineer in your district ready to help you select the right grade of Kennametal, and to determine the proper tool design and the most efficient machine set-up. When these factors are nicely balanced—Kennametal breaks production records!

Get acquainted with Kennametal. Write for our descriptive Catalog 44 that contains information on tool design, use, and maintenance.





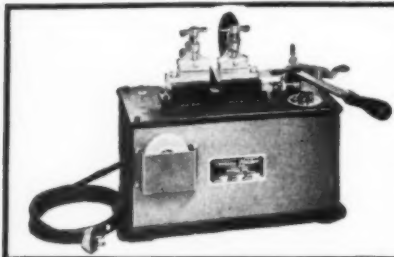
Beading and flaring are performed on this speedy, easily operated machine. Built to bead or flare aluminum and steel tubing $\frac{1}{4}$ " to 3" O.D. simply by changing tools and dies, the machine was designed and built at North American's Dallas plants. The various functions of the machine are automatically controlled in conjunction with air and hydraulics.

nate manhours. Its hydraulic setup uses a 3" to 1" air piston to 2" piston in oil. A $1\frac{1}{2}$ hp two-speed electric motor provides drive. Air pressure services the backup stroke, jaws and quill. An eccentric stud forces against the work to accomplish the flare, which is located and locked in dies, an air cylinder on a toggle being used to close them.

Mr. F. Trager, assistant superintendent, Plant "A", pointed out a very unusual machining operation worthy of special mention, illustrative of N.A.A. tooling originality, particularly in arrangement of an undercut scribing tool which represents a neat associated forming operation in a machining sequence on a piston rod stop. This part is cut from 2" round 24 ST Alloy bar and is rough drilled

with a step-flat drill at 1000 rpm. It is then bored at the same rate of speed, formed with an undercut scribing tool and cut off with a trailing parting tool, held in a tool holder while the part is being cut off. This progressive operation at the same speed in the same tool holder is exceptional. The operator finishes the operation by burring the sharp edges from the finished part. A photograph illustrates the operation.

These are just a few of the many N.A.A. tooling achievements observed in a swift plant visit. They indicate the originality, ingenuity, and skill that characterizes the Texas Division, and are a fundamental cause of its outstanding record in production per manhour and in square feet of floor area.



BAND SAW WELDERS

The No. 141 Bench Type Metal Working Band Saw Welder is available with or without grinder. Work can be annealed without removing from the Welder. Band saws up to $\frac{3}{4}$ " wide may be welded. 220 and 110 Volt, 60 Cycle, single phase. 5 point heat control. 1 point anneal heat. Shipping weight 79 lbs. Let us send you further details.

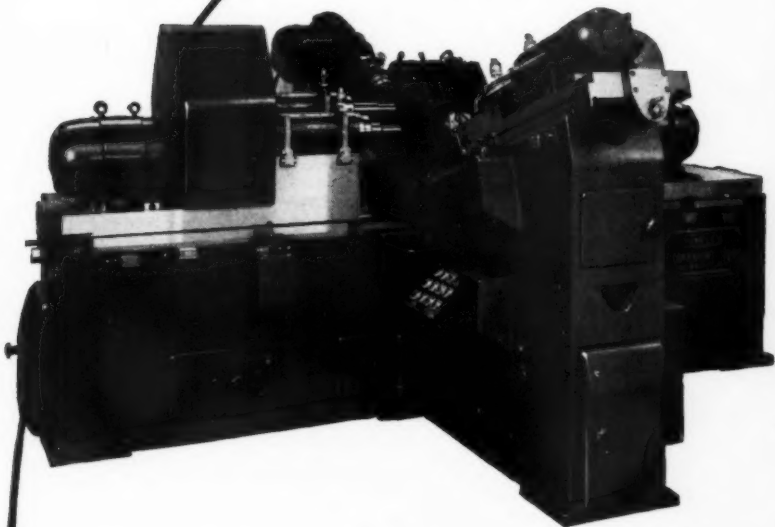
Mfrs. of complete line of Spot, Butt, Seam, Flash, Projection and Special Welders.

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New designs and new materials, fashioned to tolerances never before possible, must be finished rapidly and economically. The new way—a machine with precision spindles, precision spaced, performing all important and correlated operations at one setting of the piece. It may be the answer to your problem now, next month or next year.

This SIMPLEX 2U 4-way 10-spindle Precision Boring Machine has made a production item of an intricate gear case which had been practically a tool-room job —yet it has sufficient inherent flexibility to permit it to be adapted to normal development changes as they occur.



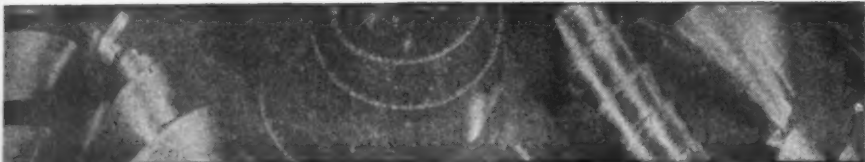
Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Precision Boring Machines and Planer Type Milling Machines

4530 West Mitchell Street, Milwaukee 14, Wisconsin

PRESS *One Button* FOR



One button starts each automatic cycle on the Monarch Magnamatic Lathe. On the same panel are all other electrical controls for set-up and automatic operation.

For many varieties of turning, boring or facing work, Magnamatics have proved amazing timesavers. Average set-up time is from 5 to 15 minutes. This permits a Magnamatic to be used economically on short runs . . . yet its completely automatic operation makes it invaluable for machining parts in large quantities.

Any number of diameters or lengths with intervening tapers or contours are produced automatically and precisely on the Magnamatic. A reasonable number of tools can be held in the rear carriage slide for facing, necking or chamfering work. Single point tools are guided by gage blocks, micrometer heads or solid template, depending upon the work.

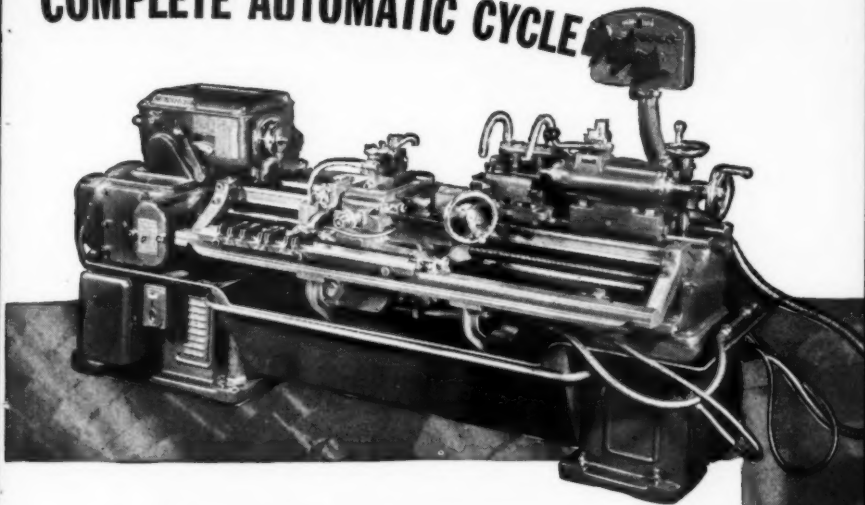
Our engineers will gladly work with you to help you save time and reduce costs with Monarch Magnamatics.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

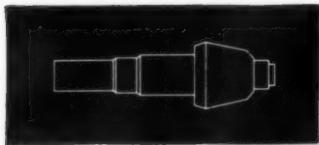
Direct factory branches: 622 West Washington Blvd., Chicago
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MONARCH LATHES

COMPLETE AUTOMATIC CYCLE

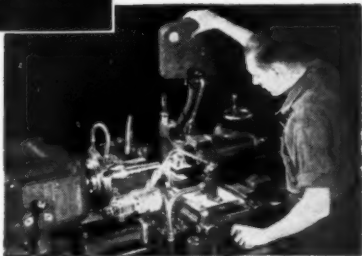


Example of typical Magnamatic job



This Monarch Magnamatic is turning a truck bevel pinion (10 $\frac{3}{4}$ " long) from a template, with diameters and tapers as indicated. Set-up time with template and rear tools is only 15 minutes. One operator tends two machines, producing 32 pieces per hour.

Magnamatics were developed before the war. Production was interrupted to enable us to deliver standard lathes for War work. Now, we return Magnamatics to the Monarch line.



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**POWER-DRIVEN — NEW TYPE
4" DIAMETER**



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This sturdy former is of the latest improved design ruggedly constructed for heavy-duty service. The slip roll feature makes it easy to remove formed materials from the machine.

The rolls are of tough steel, turned and polished. Bottom and backup rolls have circular grooves for forming work with outside wire edges.

All machines are supplied complete with motor and drum type reversing switches. Sizes range from 38" to 98" roll length and will be furnished with all three rolls power driven if desired.

Heavier motor-driven machines are also available either in initial or pyramid type. We can also furnish lighter hand-powered bench and floor type machines. Let us send you descriptive literature.

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Continued
Outstanding
Performance

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ON OUR OWN
PRODUCTION LINES!

LEMPCO

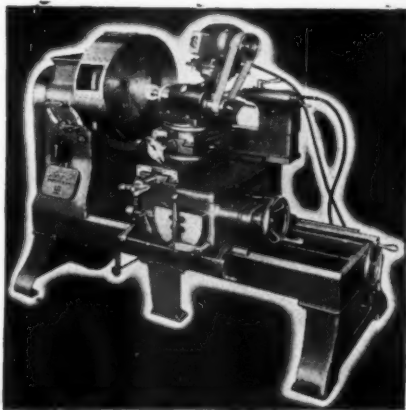
DESIGNERS • BUILDERS • USERS
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PRODUCTION - PROVED MACHINES

The new, improved Lempco Model HGX heavy-duty universal grinder pictured to the right has a big 53" swing. It turns and grinds, internal, external, face and taper jobs! Compound, calibrated to thousandths, is easily and quickly set for precision taper grinds and turns! Three quick-change speeds for both cross-feed and table-feed. Automatic trips and feeds insure skilled work.

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Fundamentals



In continuing this series of typical milling operations which will run thru subsequent issues, it is well to repeat the three fundamental principles of good machine tool practice. These vital points embrace good work piece setups, proper choice and assembly of cutters, and correct operation of the machine. You are learning to apply these important requirements in actual cases by constant repetition. The object is to form the habit of considering milling machine setups in terms of these fundamental principles. After this habit has been acquired, it will serve as a constant guide to sound milling practice. Consideration and study of the jobs described will be helpful in handling variations of these operations. (The Editor)

Flats On Spline Sleeve

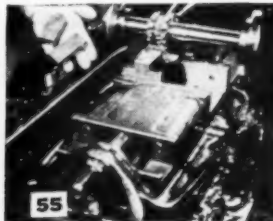
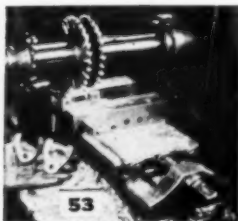
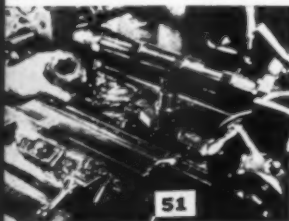
Milling the flats on a spline sleeve requires the use of a 2"x1", high speed steel form cutter. The material in these sleeves is SAE 4615 steel. The workpieces are mounted between a dividing head and tailstock set on the table of a No. 1 Plain Horizontal Milling Machine, the spindle of which revolves at 85 rpm. The workpiece is being fed at the rate of 3 3/4"

per minute. A production schedule of 12 hours per 100 pieces is maintained. (See Example 50).

On this job, the operator has used a dividing head to advantage, both for accurately spacing the seven flats that are milled in this sleeve, and in obtaining an economical setup. Four pieces mounted on a mandrel are milled in one pass. Note how the jack has been located to absorb the downward cutting forces. (See Fig. 51).

Straddle Mill Shifter Fork

Straddle milling the inside of a shifter fork calls for the use of two 6" diameter hss staggered tooth cutters. The material is SAE 65 bronze. The cutter is revolving at 96 rpm while the work is being fed at the rate of 7 1/2" per minute. By using a vise equipped with special jaws, it is possible to produce 100 pieces in 5.4 hours. (See Example 52).



Three typical milling jobs—the small numbers appearing on these and the other illustrations correspond with the Figure Numbers given in the text.

The **KNIGHT** **MILLER** **No. 40**

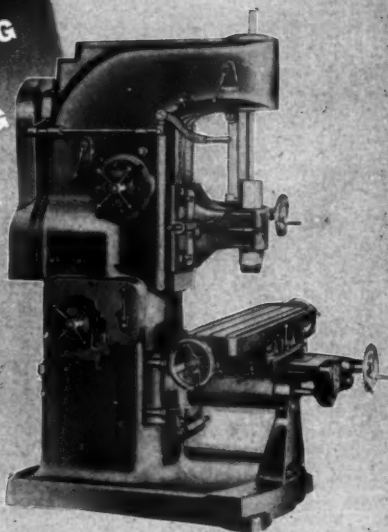
Performs . . .

**FIVE OPERATIONS AT ONE
SETTING**

- **BORING**
- **MILLING**
- **SLOTING**
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- **KEYWAY
CUTTING**

This milling machine will perform and accurately produce to full capacity at all speeds and feeds. Here are some of the ways that the **KNIGHT MILLER** can save you valuable hours on many jobs. Equipped with a special swivel and tilting table that saves the use of angle plates, cutters and special fixtures. The No. 40 has a wide range of capacity fitting it for many jobs and uses. There are 16 different spindle speeds and 18 different table feeds available.

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1300 S. Washington Ave., Minneapolis, Minn.

The object of this operation is to straddle mill the inside of the shifter fork and to remove at the same time the casting gate. An unmilled and a milled part are shown at the left.

Two staggered tooth side mill cutters chosen for this operation do a smooth job of cutting because the horizontal pressures on the staggered teeth are balanced, and the forces do not materially disturb the setup. The setup, however, may be criticized as to the manner of holding workpiece in the vise. The jaws of the vise will not remain parallel since the clamping pressure is concentrated on one side of the jaw. If the shifter fork were located in the center of the vise jaws, the cutters could be closer to the column face, and in turn, the arbor support located closer to the cutters. Thus, the entire setup could be improved considerably. (See Fig. 53).

EXAMPLE NO. 50

Job Description—Mill flats on splined sleeve.
Material—SAE 4615
Machine—No. 1 Plain
Speed—85 rpm.
Feed— $3\frac{1}{4}$ ipm.
Production rate—12 hours/100 pieces.
Fixture—Dividing head and tailstock.
Cutters—1"x2" h.s. form.

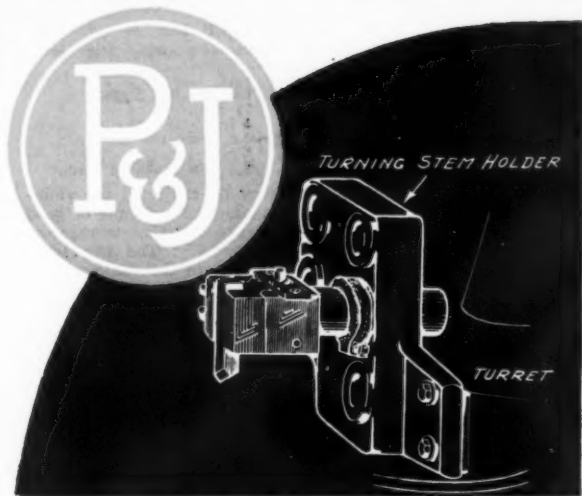
EXAMPLE NO. 52

Job Description—Straddle mill inside of shifter fork.
Material—SAE 65 bronze.
Machine—No. 3 Plain
Speed—96 rpm.
Feed— $7\frac{1}{8}$ ipm.
Production rate—5.4 hours/100 pieces.
Fixture—Vise and special jaws.
Cutters—Two 6" h.s. staggered tooth.

Straddle Mill Block

In order to straddle mill a trip lever block of SAE 1020 steel, a $2\frac{1}{2}$ " interlocking form cutter is mounted on the arbor of a Simplex Bed Type Milling Machine. The cutter is revolving at a speed of 77 rpm while the feed selected for this operation is five inches per minute. The workpiece is held in a vise and the production schedule under these conditions is 3.6 hours per 100 pieces. (See Example 54).

Interlocking form cutters are used in this operation in order to mill the profile as shown on the piece in the the operator's hand.



This is one of an extensive series of tools available for Potter & Johnston Automatics. The line includes many effective modern aids to low cost production.

STANDARD MICROMETER TURNING STEM—STRAIGHT

The micrometer mechanism incorporated in this Stem will permit quick and accurate setting of the cutter to the required diameter. Due to the upright position of the cutter and the compact head of the Stem, cuts close to the Stem Holder may be made if the shape of the work makes this necessary. Boring, as well as turning cuts may be made with this Straight Stem. When desirable, a Turning Stem Link (5D, 6D and 8D's) may be used to increase the anchorage of the Stem and the ease of setting the cutting angle of the cutter.

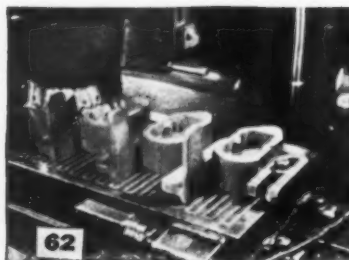
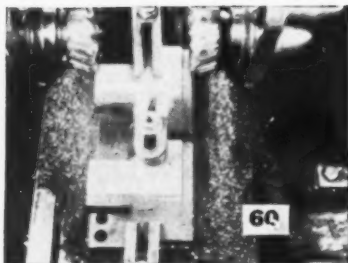
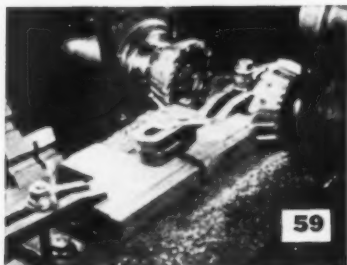
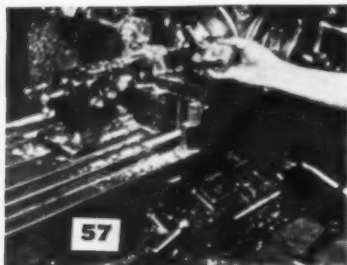
These stems are sturdily constructed of selected and hardened machine steel and bearing surfaces are ground.

A Catalog of essential data

You will find a wide range of efficient modern tooling items in this attractive new catalog if you are a user of P. & J. Automatics. May we send you a copy? There is no obligation.



POTTER & JOHNSTON MACHINE COMPANY
Automatic Machine Tools PAWTUCKET, RHODE ISLAND



EXAMPLE NO. 54

Job Description—Straddle mill trip lever block.

Material—SAE 1020
Machine—Simplex Bed Type.
Speed—77 rpm.
Feed—3 ipm.
Production rate—3.6 hours/100 pieces.
Fixture—Vise.
Cutters—2½" interlocking form.

The setup may be criticized for violation of the fundamental principle of good practice which demands that workpieces must be held properly. The trip lever block is not gripped in the center of the jaws of the vise. As it is held, the vise jaws are thrown out of alignment and cannot be relied upon to hold the work accurately. The entire cutter assembly, too, could then have been moved closer to the rigid upright. (See Fig. 55).

Mill Shifter Yoke Arm

The milling of this shifter yoke arm of an SAE No. 65 Bronze on a No. 3 Plain Horizontal Milling Machine is performed by using a 2½"x1" high speed steel form cutter. The speed is 124 rpm while the feed is 4½" per minute. The workpiece is mounted between a dividing head and tailstock, and the production rate is six hours per 100 pieces. (See Example 56).

EXAMPLE NO. 56

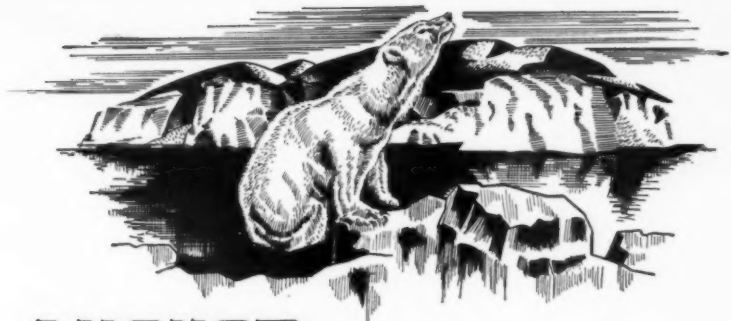
Job Description—Mill shifter yoke arm.

Material—SAE 65 Bronze.
Machine—No. 3 Plain.
Speed—124 rpm.
Feed—4½ ipm.
Production rate—6 hours/100 pieces.
Fixture—Dividing head and tailstock.
Cutters—1x2½" h.s. form.

For this job, the operator properly selected a form mill cutter that corresponds to the specifications required in the blueprint for the finished size of the shifter yoke arm. The operator has made a correct dimension and cutting setup by providing a suitable, solid stop against the arm not being milled. This prevents the downward cutting forces from revolving the workpiece when the cut is being taken. (See Fig. 57).

Rough and Finish Mill Cap

In this operation a Duplex Bed Type Milling Machine is used to mill the front and back faces of a drive bracket cap of a special cast iron. Both 7" diameter tungsten carbide tipped face mill cutters are revolving at 222 rpm while the work



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Can be sharpened after center is destroyed.

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1279 W. 3rd St. Cleveland, Ohio

is being fed into them at a rate of 10" per minute. (See Example 58).

EXAMPLE NO. 58

Job Description—Rough and finish mill front and back face of drive bracket cap.

Material—	Special Cast Iron.
Machine—	Duplex Bed Type.
Speed—	222 rpm.
Feed—	10 ipm.
Production rate—	10 hours/100 pieces.
Fixture—	Adapter Plate.
Cutters—	7 TC face mill.

Here is a good illustration of controlling cutter forces and obtaining the most rigid setup possible. The top teeth of the cutters are revolving toward the observer in a climb milling cut. The pressures of the cutting forces are directed downward against the table where they are absorbed by the solid construction of the bed. There is no tendency in this setup to lift the workpieces off the table; in fact, the cutting forces are actually helping to hold the job rigidly. (See Fig. 59).

A birdseye view of this setup shows the careful clamping of both workpieces. Two clamps are used on the center T-bolt in order to provide greater distance between the workpiece and the nut. By being able to load and mill two pieces at one time, the principle of economy in operation has been observed. (See Fig. 60).

Milling Table Bracket

This operation calls for milling of front face of the cast iron table bracket. An 8" diameter tungsten carbide face mill is mounted in the spindle of a No. 4 Sliding Head Vertical Milling Machine. This spindle is revolving at 125 rpm while the work is being fed at a rate of 8" per minute. Under these conditions and by using a magnetic plate or chuck for holding the workpieces, a production rate of 100 pieces per eight hours is obtained. (See Example 61).

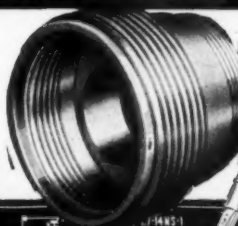
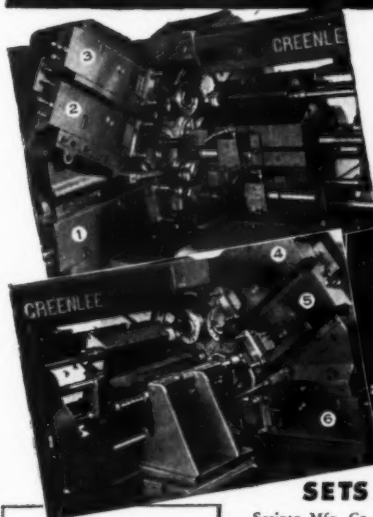
EXAMPLE NO. 61

Job Description—Mill front face of table bracket.

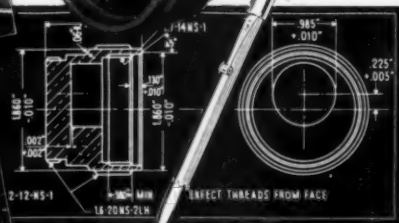
Material—	Cast Iron.
Machine—	No. 4 Sliding Head Vertical
Speed—	125 rpm.
Feed—	8 ipm.
Production rate—	8 hours/100 pieces.
Fixture—	Magnetic Chuck.
Cutters—	8" TC face mill.

Cutting forces are directed towards the right in the illustration and also away from the observer. They are counteracted,

BOOSTING PRODUCTION OF BOOSTER BODIES WITH GREENLEE 6 SPINDLE AUTOMATICS



15 Operations Completed in Record Time. Gross Production Rate — 400 Per Hour or 9 Seconds Per Piece.



SCRIPTO MFG. CO. SETS FAST PRODUCTION PACE

INDEPENDENTLY OPERATED CROSS-SLIDES PERMITTED EFFICIENT TOOLING SET-UP

Photos above show tooling set-up used to produce booster bodies. Cross-slides are independently operated by separate cams — make possible efficient tooling set-ups.

Sequence of Operations

- 1 Drill large diameter. Rough form two small diameters — form large outside diameter.
- 2 Bore large diameter. Form O. D. Face and chamfer end of piece.
- 3 Rough bore eccentric hole. Shave outside diameter.
- 4 Roll thread on small O. D. Finish bore eccentric hole.
- 5 Cut thread on large O. D. Chamfer and break down for cut-off.
- 6 Tap inside thread. Cut-off.

Gross Production Rate — 400 per hour

Scripto Mfg. Co., — producers of world famous, high quality mechanical pencils for consumers and industrial users — has established a noteworthy record in production expediting with two Greenlee 6-Spindle Screw Machines. Their net machine output of brass boosters, a shell fuse part, set a fast production pace over a 2½ year period. Here is typical production data characteristic of Scripto's efficient methods of operation which has won them the Army-Navy "E" Award:

Month	Scheduled Operating Hours	Net Production Efficiency
April.....	658.....	78.0%
August.....	626.....	71.5%
September.....	528.....	74.6%

NOTE: All time losses for tool adjustments, breakage, mechanical failures, etc. are included. Due to high rate of production, approximately 10% of downtime is required for stocking.

For this kind of performance, credit is also due Scripto operators. With no multiple-spindle experience and with as little as 3 months' training on single-spindle machines, they quickly acquired the skill to maintain the Greenlees on continuous production. Mechanical features on the Greenlee — *simplicity of design and ease of tool adjustments* — offer surprising aid today under wartime conditions and promote efficiency on many short as well as long run jobs.

Write today for full facts.

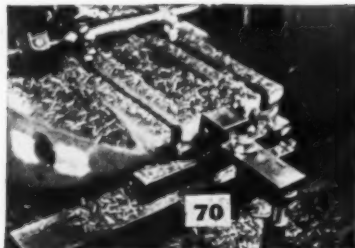
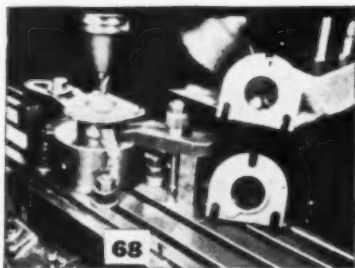
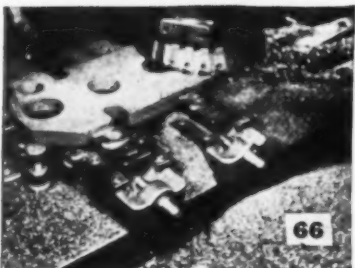
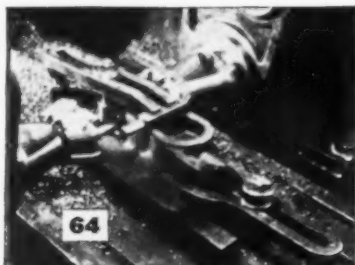


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not only by the magnetic forces which hold the workpieces down, but also by the stops at the right and the back against which the pieces are laid. Each piece is set flush, one against the other, and all against the back stop, with the first piece to the right against the end stop. (See Fig. 62.)

Mill Table Bracket

In milling top and bottom edges of a table bracket, 5" tungsten carbide tipped face mill cutters are used. The brackets are mounted and clamped to the table. The spindles of the Duplex Bed Type Milling Machine are revolving at a rate of 275 rpm. The table is carrying the work into the cutter at a rate of 10" per minute. Production schedule under these conditions is 9.6 hours per 100 pieces. (See Example 63).

EXAMPLE NO. 63

Job Description—Mill top and bottom edge of table bracket.

Material—Cast iron.
Machine—Duplex Bed Type.
Speed—275 rpm.
Feed—10 ipm.
Production rate—9.6 hours/100 pieces.
Fixture—Parallels and clamps.
Cutters—5" TC face mill.

The table setup in this operation is an excellent one, from the standpoints of simplicity and rigidity. Note how securely the workpiece, mounted on parallels, is held at top and bottom by table clamps. The high feed at which the workpiece engages the cutter is possible with this rigid setup. (See Fig. 64).

Face Mill Bearing Plate

In order to face mill a bearing plate as called for in this operation, a 12" tungsten carbide face mill is mounted on a Style C Type Arbor set in the spindle of a Bridge Type Vertical Milling Machine. The spindle is revolving at 103 rpm while the feed rate is 11" per minute. By using special vises and jacks and with the feeds and speeds indicated, 100 pieces are milled in 16 hours. (See Example 65).

EXAMPLE NO. 65

Job Description—Face mill bearing plate.

Material—Cast Iron.
Machine—Bridge Type Vertical.
Speed—103 rpm.
Feed—11 ipm.
Production rate—16 hours/100 pieces.
Fixture—Special vises and jacks.
Cutters—12" TC face mill.

Ideas FOR DESIGN-ENGINEERS—IN THESE USES OF *S.S. White Flexible Shafts*



POWER DRIVE

flexible shaft operated concrete vibrators have proved very satisfactory for agitating concrete after pouring to make it flow into all parts of a mold and to compact it. The equipment illustrated uses a 12-foot .437" diameter shaft operating at 9000 r.p.m. It is another example of how S. S. White flexible shafts make practicable needed portable equipment, and of the satisfactory performance of these shafts in high speed, heavy duty service. Photo courtesy of the Vibro Company.

ONE OF A SERIES
showing typical
POWER DRIVE and
REMOTE CONTROL
applications

TWO-IN-ONE

action is needed to set this automobile clock. The spindle which turns the hands must be pushed in against a spring pressure and then turned. As shown, a single flexible shaft provides the required "push-pull" and brings the control knob out to the most convenient operating point. A similar arrangement reset on speedometers. The idea that flexible shafts can be used for both push-pull and rotation is a good one to remember.



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Tables of basic data on power drive and remote control shafts are given in BULLETIN 43. A copy will be mailed on request. Write for yours today.

S.S. WHITE INDUSTRIAL DIVISION

THE S. S. WHITE DENTAL MFG. CO. DEPT. H 10 EAST 40th ST., NEW YORK 16, N. Y.



FLEXIBLE SHAFTS

AIRCRAFT ACCESSORIES

MOLDED PLASTICS

MOLDED RESISTORS

FLEXIBLE SHAFT TOOLS

This operation is a good example of milling practice, for several reasons:— In the first place, a simple but effective table setup has been made. The use of two vises, jacks and end stops should be observed. Secondly, the choice of 12" tungsten carbide face mill cutter, revolving at 103 rpm permits faster and more economical milling of this bearing plate.

In devising this setup, center line of the cutter does not coincide with the long center line of the workpiece. By setting the cutter off-center in the manner shown, the tendency for the cutter to draw the workpiece with it has been eliminated. In the milling of such flat surfaces, provision for this cutter and workpiece relationship must be made in the setup. (See Fig. 66).

Mill Pads On Retainers

Operation data for the milling of pads on cast iron bearing retainers suggests use of a No. 2 Sliding Head Vertical Milling Machine to do the job. The bearing retainers are held in a chuck which is clamped to the milling machine table. The workpiece is fed by hand to the

15/16" hss end mill, revolving at 412 rpm. (See Example 67).

EXAMPLE NO. 67

Job Description—Mill pads on bearing retainers.

Material—	Cast Iron.
Machine—	No. 2 Sliding Head Vertical
Speed—	412 rpm.
Feed—	By Hand.
Production rate—	5.1 hours/100 pieces.
Fixture—	Chuck and table clamp.
Cutters—	13/16" hs end mill.

The interesting feature of this setup is the use of a chuck to hold the bearing retainer. In turn, the chuck is held securely by two table clamps.

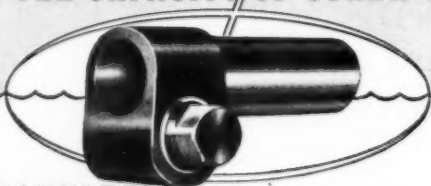
In feeding this workpiece by hand, the operator uses markings on front of the table and top of the saddle as guides for the approximate spacing of the slots and pads. This saves time in changing the workpiece after each slot and pad are milled. (See Fig. 68).

Mill Slots In Upright

In order to mill slots 1 3/4" deep into the upright in this operation, two 1-1/16" wide staggered tooth cutters are mounted on the arbor of a Simplex Bed Type Milling

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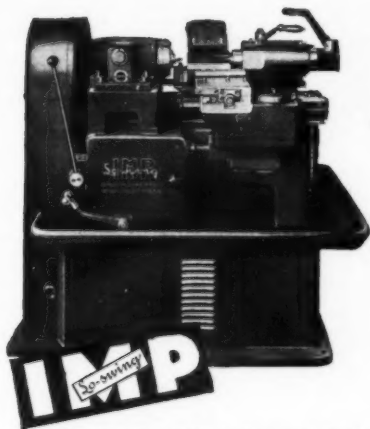
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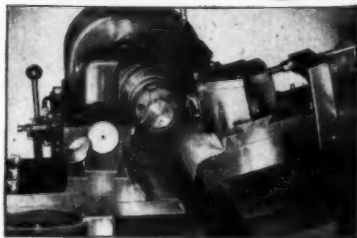
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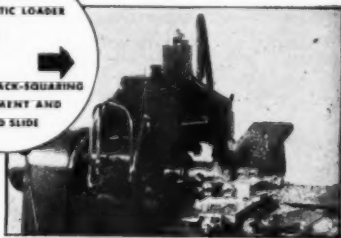
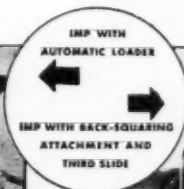
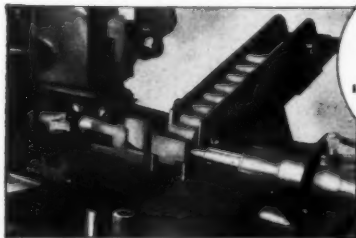
The Lo-swing IMP Lathe lends itself to practically unlimited tooling possibilities. Illustration above shows a standard machine. The close-up views show three typical applications of standard and special attachments to the base machine which have resulted in increased production and lowered costs.

If you have a turning job requiring high speeds, fine finishes and extreme accuracy, write for IMP Bulletin N-42.

SENECA FALLS MACHINE CO.
Seneca Falls, N. Y.



IMP WITH BACK-SQUARING ATTACHMENT



LATHE NEWS *from* SENECA FALLS

Machine and the spindle speed is 26 rpm. With a table setup and a feed rate of 3" per minute, a production schedule of 100 pieces in 24 hours is reached. (See Example 69).

EXAMPLE NO. 69

Job Description—Mill $1\frac{1}{4}$ " slots in upright.
Material—Cast iron.
Machine—Simplex bed type.
Speed—26 rpm.
Feed—3 ipm.
Production rate—24 hours/100 pieces.
Fixture—Table setup.
Cutters—2— $1\frac{1}{16}$ " staggered tooth.

The two staggered tooth cutters are mounted on a Style B Arbor spaced in accordance with the specifications. The table setup, using parallel bars and clamps is satisfactory as is also the relationship of the workpiece to the spindle and the arbor supports for the cutters.

Staggered teeth cutters are properly used in this operation (1)—because with the horizontal forces balanced on the cutting edges, there is less likelihood of chatter; (2)—since staggered teeth tend to break up the chips in a narrow groove, pressure between the workpiece and the

cutter, due to the packing of chips in the narrow groove is prevented. (See Fig. 70).

Bore Dividing Head Frame

Two $4\frac{1}{2}$ " diameter staggered tooth cutters are used to bore a dividing head frame as called for in this operation. These cast iron frames are mounted on an adapter plate bolted to the table of a No. 4 Plain Horizontal Milling Machine. The cutters are revolving at 44 rpm while the feed rate is $2\frac{1}{2}$ " per minute. (See Example 71).

EXAMPLE NO. 71

Job Description—Bore dividing head frame.
Material—Cast iron.
Machine—No. 4 Plain.
Speed—44 rpm.
Feed— $2\frac{1}{2}$ ipm.
Production rate—7.5 hours/100 pieces.
Fixture—Adapter plate.
Cutters—Two $4\frac{1}{2}$ " staggered tooth.

The staggered tooth cutters used for this operation have cutting edges on one side only. In this job, they are mounted with the teeth toward the column face. The workpiece is fed into these cutters with the cross feed so that the table moves outward, toward the operator.

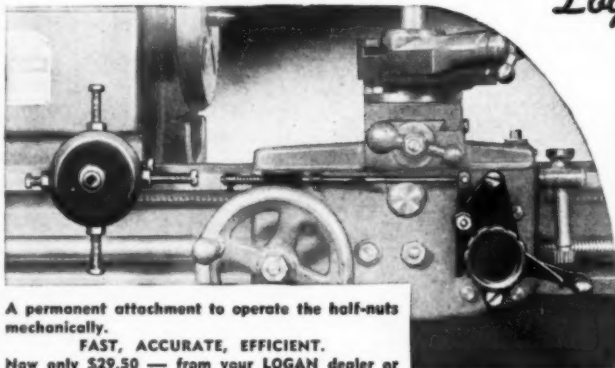
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THREAD AND FORM
MILLING CUTTERS
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This is a noteworthy instance of the economical use of a milling machine for boring purposes. The workpiece is mounted on an adapter plate which permits quick and easy clamping.

The final boring operation on this dividing head frame is performed on a boring bar with the cap bolted in place. This last operation constitutes the finish cut necessary for boring to the required diameter. (See Fig. 72).

EXAMPLE NO. 73

Job Description—Straddle and slot mill hinge.
Material—SAE 1020.
Machine—No. 3 Plain.
Speed—57 rpm.
Feed— $1\frac{1}{2}$ ipm.
Production rate—20 hours/100 pieces.
Fixture—Special.
Cutters—Two $6\frac{3}{4}$ " Straight Side.
Two $4\frac{1}{2}\times\frac{3}{4}$ " interlocking.

Straddle and Slot Mill Hinge

In this operation, a hinge of SAE 1020 steel is straddle and slot milled. Two $6\frac{3}{4}$ " straight side cutters are used for the straddle milling operation while two $4\frac{1}{2}\times\frac{3}{4}$ " interlocking cutters are used for slotting. These cutters are mounted on

the arbor of a No. 3 Plain Horizontal Milling Machine and are revolving at 57 rpm. The work is being fed into this assembly of cutters at a rate of $1\frac{1}{2}$ " per minute. (See Example 73).

An interesting assembly of cutters is used to perform this operation. The two side cutting mills are set up for straddle milling while the two interlocking cutters in the center are assembled for milling the slot of the hinge.

The setup is commendable for the position of the table with respect to the column face, and the position of the arbor support with respect to the cutters.

The interlocking cutters, however, as used for this slotting operation, are not recommended. The angle of the cutting edges tends to force the chips away, both to the right and to the left, hence wedging them between the straddle mills and the two sides of the slots. Thus, a pressure will be built up between the cutter and the workpiece that will inevitably produce inaccurate workmanship and possibly cutter breakage. (See Fig 74).



C-F POSITIONERS

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can see...*

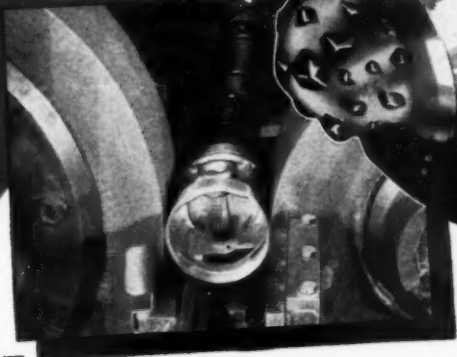


through the light haze of this gigantic welding department extend triple rows of C-F Positioners. From this almost endless production line (the photograph is taken from the half-way point) each day come heretofore unheard of numbers of fabrication with all seams, joints and unions strongly and smoothly welded "downhand". There are no handling problems or delays, for on C-F Positioners each welder positions his weldment for succeeding welds with a push-button control—can rotate it at any desired speed (360°) or tilt it to any angle up to 135° beyond horizontal.

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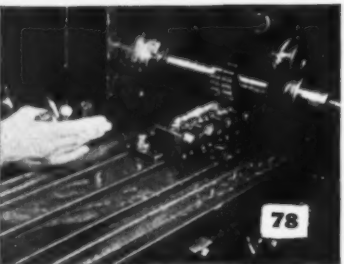
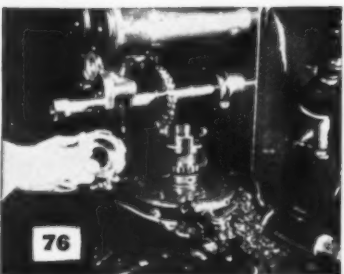
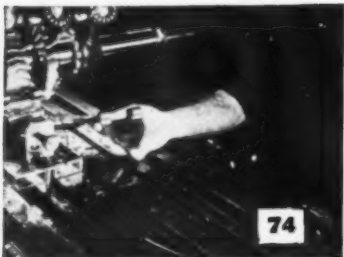
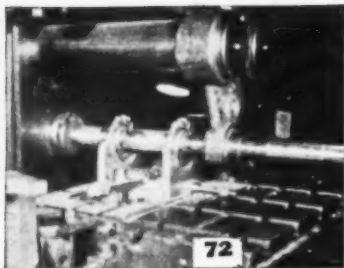
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Mill Clutch Gear

In order to mill the driving tongues of this clutch gear, two 6" high speed steel interlocking cutters are employed. These cutters are mounted on the arbor of a No. 2 Plain Horizontal Milling Machine and are revolving at 58 rpm. These gears of SAE 4615 steel, are being fed into these high speed cutters at a rate of $9\frac{1}{4}$ " per minute, thus making possible a production schedule of 18 hours per 100 pieces. (See Example 75).

EXAMPLE NO. 75

Job Description—Mill Clutch Gear.
Material—SAE 4615
Machine—No. 2 Plain.
Speed—58 rpm.
Feed— $9\frac{1}{4}$ ipm.
Production rate—18 hours/100 pieces.
Fixture—Index
Cutters—Two 6" hs interlocking.

The clutch gear as a workpiece is mounted on an indexing fixture in order to bring the workpiece around to the various stations demanded for accurate spacing of the driving tongues.

A staggered tooth cutter again was chosen for this operation. As explained previously, when doing milling of this kind, chatter is a troublesome problem. This is eliminated, in part at least, by using a staggered tooth cutter in which the horizontal pressures are equal and opposed and, hence, result in a well-balanced cutting tool. (See Fig. 76).

Mill Tang On Wrench

The milling of a tang on a heavy duty wrench is accomplished in this operation by using two, 4"x1" side cutters. A No. 2 Plain Horizontal Milling Machine with spindle revolving at 130 rpm is used. The table is moving at a rate of 9" per minute. An eight piece holding fixture makes possible a production schedule of 100 pieces in 1.6 hours. (See Example 77).

EXAMPLE NO. 77

Job Description—Mill tang on heavy duty wrench.
Material—SAE 4640.
Machine—No. 2 Plain.
Speed—130 rpm.
Feed—9 ipm.
Production rate—16 hours/100 pieces.
Fixture—8 piece holding.
Cutters—Two—4"x1" side.

Eight of these workpieces are mounted in the fixture and each is separately clamped, thus insuring that each piece is

what has this to do with broaching?



THAT depends upon how you look at it. Pictured here is a crude, two wheeled cart, still used in transportation. The wheel is a pretty commonplace thing these days — yet the wheel, as time has proved, was one of the most revolutionary inventions for the comfort and convenience of Man. In its rudimentary form it took heavy loads from Man's back and gave him greater mobility. As a means for utilizing the tremendous energy of falling water, the water wheel harnessed nature to turn other wheels — to grind corn and to power the earlier machines which in turn allowed Man to work *less* . . . and produce *more*. Almost unrecognized it exerted a profound influence on our lives and habits. In modern streamlined transportation — railroad, automobile, airplane — the wheel enables man to have far greater pleasure in the world about him, vacationing and visiting with friends both near and far. Actually, civilization has sprung from the ruts of countless wheels.



So, too, with Broaching . . . from a primordial type of drilling to present day precision production, Broaching's principles have been amplified until they now cover the entire metal-working field. Just as the use of the wheel expanded from the crude vehicle stage to its present use in diverse sizes and shapes . . . in intricate machinery making countless tools, machines, and vehicles for Man's even greater comfort and convenience . . . just so will Broaching become an increasingly powerful influence in making machines to turn out more and better and cheaper products to lessen Man's work and increase the joy of living.

Earliest historical references to Broaching mention use of a toothed tool to form tap holes in wine barrels.



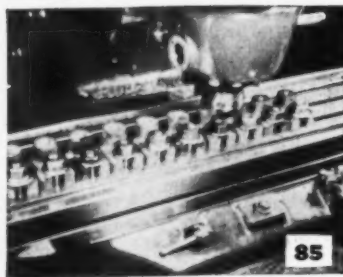
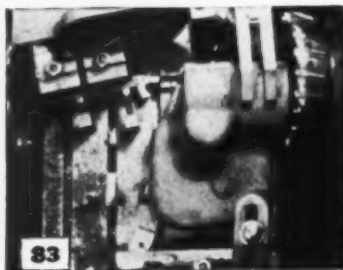
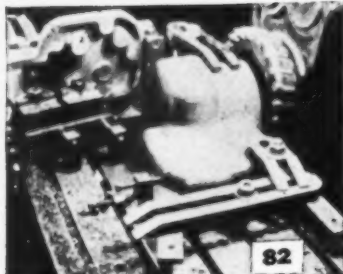
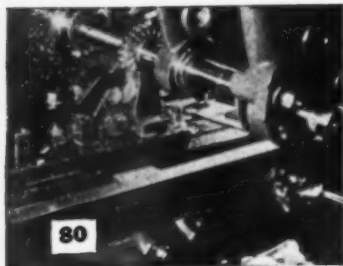


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rigidly held. Since the diameters of these rough shanks vary considerably, one long jaw in the fixture cannot be used, lest the smaller diameter workpieces be lifted out of the fixture. The side cutters are spaced properly to mill the tangs as shown on the pieces held by the operator. The fixture has been properly set as close to the inner edge of the table as possible, thus bringing the cutters close to the column face, so the rules of good milling practice are observed. (See Fig. 78).

Mill Inside of Traveling Lock

This operation requires milling of the inside of a traveling lock of SAE 4130 steel. Two 6"x1½" hss interlocking cutters are mounted on the arbor of a No. 3 Plain Milling Machine. These cutters are revolving at a rate of 74 rpm while the work is being fed at 1½" per minute. By using a special fixture 100 pieces in 18 hours are milled. (See Example 79).

EXAMPLE NO. 79

Job Description—	Mill inside of traveling lock.
Material—	SAE 4130.
Machine—	No. 3 Plain.
Speed—	74 rpm.
Feed—	1½ ipm.
Production rate—	18 hours/100 pieces.
Fixture—	Special
Cutters—	Two 6x1½" hss interlocking.

The fixture used for this operation is immediately recognized as both rigid and simple. The workpiece is held firmly by the simple clamping arrangement.

The interlocking cutters are so rotated that the cutting forces are directed downward against the solid part of the fixture and, in turn, of course, against the table of the milling machine. This setup is to be commended, both for the position of the table with respect to the column face and above all, for the use of an intermediate support close to the cutter. If a shorter arbor had been available, the outer arbor support could have been eliminated. (See Fig. 80).

Face Mill Gear Housing

This operation calls for the face milling of cast iron gear housing. Two tungsten carbide tipped face mill cutters, one a 9" and the other a 10" are mounted on Style C Arbors in the spindles of a Duplex Bed Type Milling Machine. These cutters revolve at 144 rpm while the table

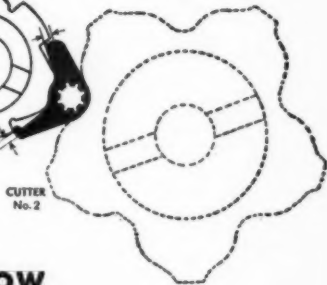
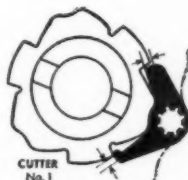
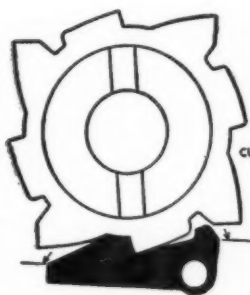
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moves the work into cutters at a rate of 8" per minute. The operation is performed using a simple table setup. (See Example 81).

EXAMPLE NO. 81

Job Description—Face mill gear housing.
Material—Cast Iron.
Machine—Duplex Bed Type.
Speed—144 rpm.
Feed—8 ipm.
Production rate—6.1 hours/100 pieces.
Fixture—Table Set-up.
Cutters—9" TC face mill on one spindle; 10" TC face mill on the other.

This table setup is noteworthy for its substitution as a fixture. The workpieces are milled so that the finished faces are at a 5° angle to the adjoining one being milled at the left. The locating blocks are set with a protractor and clamped in this position. (See Fig. 82.)

Fig. 83 directs attention to the two milling operations as being performed in one pass on a single workpiece with different diameter cutters mounted in the opposed spindles of a duplex milling machine.

Noteworthy also is the use of table clamps to hold the workpiece securely in place.

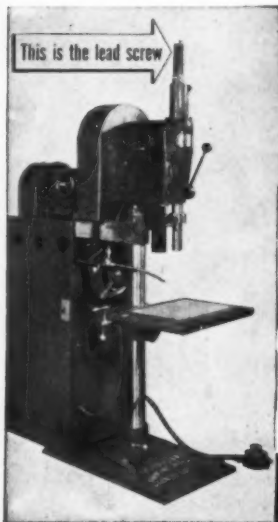
Milling Steady Rest

To mill the hold down pads and faces on the bosses of cast iron steady rests, a 3" diameter tungsten carbide tipped face mill is mounted on an arbor set in the spindle of a No. 2 Sliding Head Vertical Milling Machine. This cutter is revolving at 529 rpm and the feed is 14 1/4" per minute. By using 12 T-bolts for clamping and holding, the operator is able to mill 100 pieces in 1.5 hours. (See Example 84).

EXAMPLE NO. 84

Job Description—Mill hold down pad and face on boss of steady rest.
Material—Cast Iron.
Machine—No. 2 Sliding Head Vertical
Speed—529 rpm.
Feed—14 1/4 ipm.
Production rate—15 hours/100 pieces.
Fixture—12 T-Bolts.
Cutters—3 TC face mill.

This is a good operation to illustrate the principle of economy and intelligent planning of setup. Here, production does not justify the use of a special fixture so



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10 of these workpieces are simply and easily clamped to the table with ordinary T-slot bolts. The operator can unload and load each station successively as the cutter clears the workpieces. The sliding head vertical machine, on which this operation is performed, makes possible the vertical adjustment of the cutter to the workpiece, simply and accurately. (See Fig. 85).

Mill Clutch Teeth

To mill the clutch teeth in a drive gear made of SAE 4615 steel, a $3" \times 3\frac{1}{2}"$, hss staggered tooth cutter is mounted on the arbor of a No. 2 Plain Horizontal Milling Machine. This cutter is revolving at a rate of 119 rpm while the feed is set at $12\frac{1}{4}"$ per minute. With the aid of an indexing fixture, a production schedule of 100 pieces in $7\frac{1}{2}$ hours is attained. (See Example 86).

EXAMPLE NO. 86

Job Description—Mill clutch teeth in drive

Material—	gear. SAE 4615
Machine—	No. 2 Plain.
Speed—	119 rpm.
Feed—	$12\frac{1}{4}$ ipm.
Production rate—	7.5 hours/100 pieces.
Fixture—	Index fixture.
Cutters—	$3\frac{1}{2}" \times 3"$ hss staggered tooth..

The workpiece in this operation is mounted on a special indexing fixture which permits locating the stations called for by the specifications.

A staggered tooth cutter is properly chosen for this milling operation since, as has been indicated previously, the opposed horizontal forces on the teeth are equal. The possibility of chatter has been eliminated by using this balanced cutter for milling the clutch teeth. (See Fig. 87).

Coolant Pipe Guard

This operation calls for the rough and finish milling of a cast iron coolant pipe guard. A $5"$ diameter tungsten carbide face mill cutter, revolving at a speed of 216 rpm is used on a No. 4 Sliding Head Vertical Milling Machine. A roughing feed of $15"$ per minute and a finished feed of $17\frac{1}{2}"$ per minute are chosen for these operations. Three vises are employed for secure holding of the workpiece. (See Example 88).

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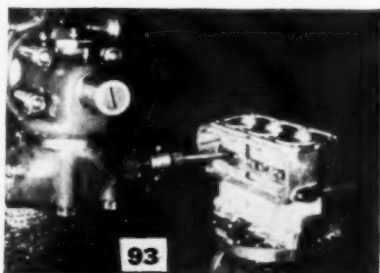
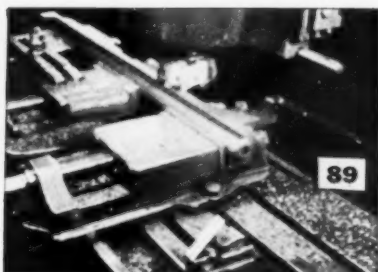
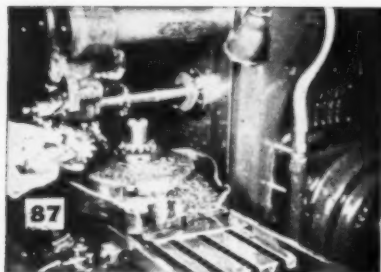
PERFORMANCE DATA
OPERATION — Turning 5" diameter at 350 S.F.P.M.
MACHINE — 18" x 54" American Pacemaker Lathe.
MATERIAL — S.A.E. 1045 steel. FEED — .022".
SPINDLE SPEED — 270 R.P.M. DEPTH OF CUT — $\frac{3}{4}$ inch.
CUTTING LUBRICANT — 1 part Sunoco to 20 parts water.

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EXAMPLE NO. 88

Job Description—Rough and finish mill coolant pipe guard.

Material—Cast Iron.
Machine—No. 4 Sliding Head Vertical
Speed—216 rpm.
Feed—13 ipm rough; 17½ ipm finish.

Production rate—20 hours/100 pieces.

Fixture—Three Vises—One clamped; One for holding; One floating.

Cutters—5" TC face mill.

Chief interest in this operation lies in the ingenuity of its setup. The long workpiece is held in three vises, the first of which (closest to the observer) is bolted to the milling machine table, while the others are permitted to "float". The workpiece is first tightened thru its largest section in the bolted vise, and then in the floating vises which are merely clamped to the table. This setup compensates for any possible casting warp-age of the long thin sections of the workpieces. In this manner, the largest cutting forces are properly absorbed by the most rigid part of the setup. (See Fig. 89).

Milling Bracket

The specifications for this job call for the milling of a 50° angle on both ends of a cast iron bracket. A 1¼" diameter end mill is mounted on a spindle of the No. 3 Sliding Head Vertical Milling Machine and revolves at 105 rpm. By using a rotary table to which the workpiece is clamped, a production schedule of 100 pieces in 38 hours is obtained. (See Example 90).

EXAMPLE NO. 90

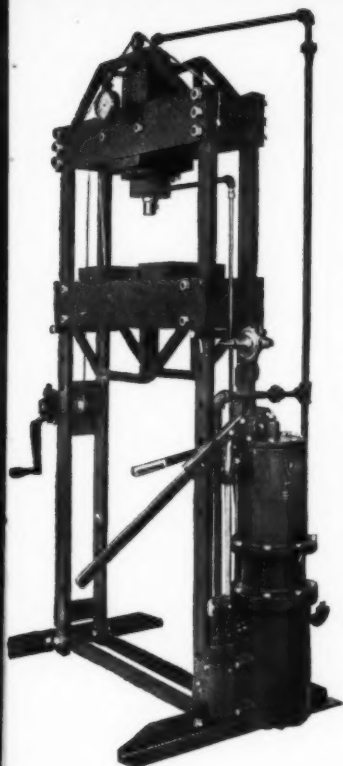
Job Description—Mill 50° angle on both ends of bracket.

Material—Cast Iron.
Machine—No. 3 Sliding Head Vertical
Speed—105 rpm.
Feed—4¼ ipm.
Production rate—38 hours/100 pieces.
Fixture—Rotary table and clamp.
Cutters—1¼" End Mill.

Here we see a common application of a rotary table or circular milling attachment. The workpiece has been securely clamped in place and the graduated base of the rotary table provides fast and accurate locating at the required angles. The entire setup represents good milling practice. (See Fig. 91).

Drill Port Holes

In order to drill the port holes in an



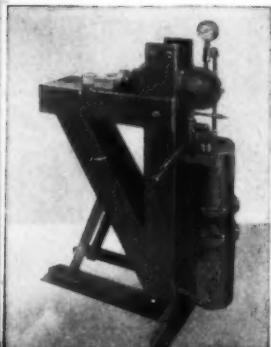
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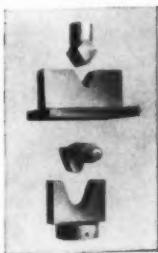
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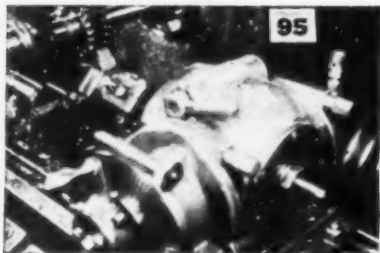
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aluminum cylinder block at a 5° angle, a 1/2" drill is mounted in the spindle of a light, high speed adjustable universal attachment set on a No. 3 Horizontal Milling Machine. The spindle speed for this job is 1500 rpm while the feed rate is 1 1/2" per minute. The cylinder block is mounted on an adapter plate, which in turn is set on an indexing head that is swung into the vertical plane. (See Example 92).

This operation exhibits considerable ingenuity in devising a correct dimension setup. The holes are drilled into the cyl-



EXAMPLE NO. 92

Job Description—Drill port holes in cylinder block at 5° angle.

Material—	Cast Aluminum
Machine—	No. 3 Plain with Standard High Speed Adjustable Universal Attachment.
Speed—	1500 rpm.
Feed—	1 1/2 ipm.
Production rate—	16 hours/100 pieces.
Fixture—	Index head and adapter.
Cutters—	3/4" drill.

inder block at a 5° angle. By clamping the cylinder block on an adapter plate, which in turn is mounted on an indexing head, this 5° angular setup is easily and quickly obtained. The choice of a light, high speed adjustable universal attachment makes the milling machine adaptable for the drilling of these holes. (See Fig. 93).

Straddle Mill Face Flanges

Two 3" hss straight side milling cutters are used to straddle mill the face flanges of a cast steel clutch engaging spider. These cutters are mounted on the arbor of a No. 3 Plain Horizontal Milling Machine and are revolving at a speed of 57 rpm. The feed rate is 1 1/2" per minute.



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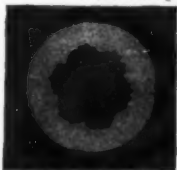
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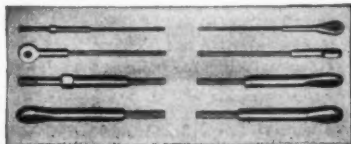
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EXAMPLE NO. 94

Job Description—Straddle mill face flanges of clutch engaging spider.
Material—SAE 1020 steel casting.
Machine—No. 3 Plain.
Speed—57 rpm.
Feed—1 1/4 ipm.
Production rate—12 hours/100 pieces.
Fixture—Dividing head, tailstock, threaded mandrel and dog.
Cutters—3" hs straight side.

This clutch engaging spider, a steel casting, is mounted on a mandrel between the dividing head and the tailstock.

The side mill cutters are properly spaced to mill the flanges according to the specifications. The dividing head is used to index the four flanges successively to the cutter. The setup is commendable for the relationship of the table to the column face and the arbor support to the cutter. (See Fig. 95).

Mill Serrations

This job calls for milling of serrations in a drive collar of SAE 1315 steel. A 2 3/4" hs, angular cutter is set in the spindle of a No. 2 Milling Machine and revolves at a rate of 153 rpm. The feed rate chosen for this operation is 12 1/4" per minute,

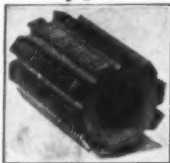
and the production rate is 100 pieces in four hours. (See Example 96).

EXAMPLE NO. 96

Job Description—Mill serrations in drive collar.
Material—SAE 1315
Machine—No. 2 Light Universal.
Speed—153 rpm.
Feed—12 1/4 ipm.
Production rate—4 hours/100 pieces.
Fixture—Dividing head and tailstock.
Cutters—2 3/4" hs angular.

A 90° angle cutter is used to mill these serrations, consisting of very narrow grooves milled by the form cutter. The collars are mounted on a mandrel, the entire assembly held tightly with an end nut, and then mounted as a unit between a tailstock and a dividing head.

The projections visible on the collar, held by the operator, necessitate use of a spacer with a corresponding slot to accommodate the projections. Thus, the pieces can be properly aligned and assembled on the mandrel. These collars are indexed thru 4° after each cut so that 90 serrations can be milled around the circumference of the collar. (See Fig. 97).



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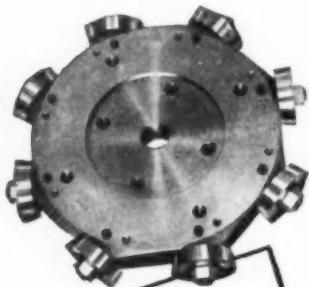
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Why Blue Flash Mounted Wheels and Points Pay Off in Greenbacks

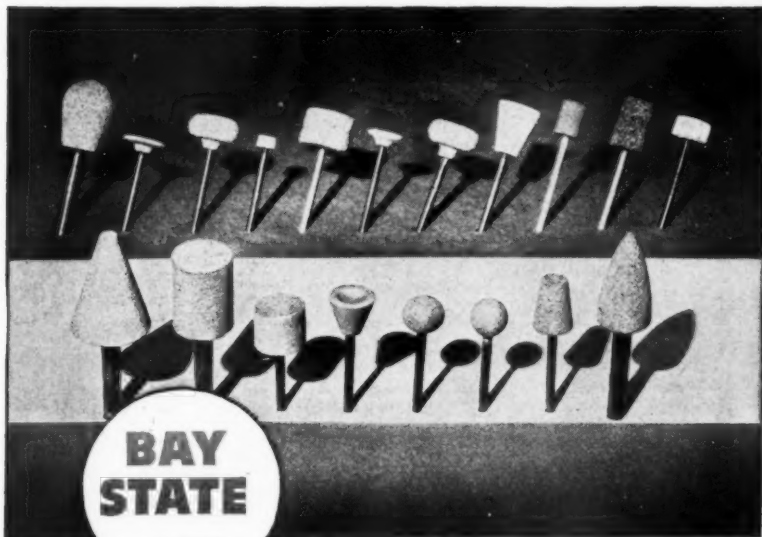
Blue Flash mounted wheels and points are ready for immediate cutting action as soon as you receive them. There is no wasteful "breaking in" period. What's more, they are free from hard and soft spots.

These unique features are the result of Bay State's special manufacturing process . . . Blue Flash mounted wheels and points are first made into uniform blanks (rather than pressed into shape form) . . . then, after mounting on mandrels, their grinding surfaces are trued to size and shape. The result . . . sharp, smooth-running, more efficient wheels that pay off in greenbacks, because they save valuable time and do more work for the money.

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Check complete details on how Blue Flash Mounted Wheels and Points "pay off in greenbacks". Send for pocket-size catalog D.

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WEIGHTS

15 oz.
 24 oz.
 2 lbs.
 8 oz.
 17 oz.
 5 oz.
 8 oz.

The new plastics Corporation whose president, Walter K. Jahn, helped refine and apply it, under a patent which gave

From a National Magazine

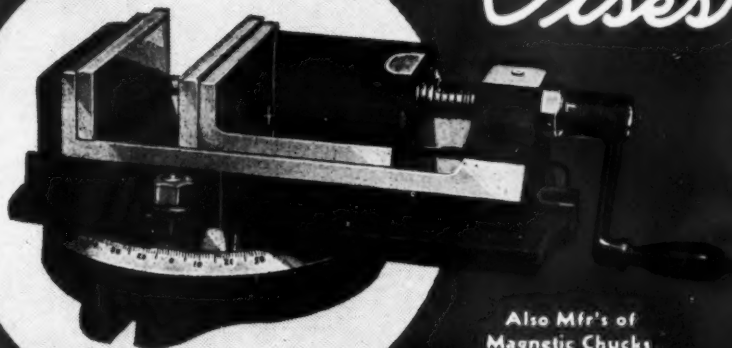
The plastic looks and feels like a cross between rubber and celluloid. Indifferent to corrosive effects of oil or alcohol, it's a defense secret, beyond the fact that it is going into airplanes and industrial use. One of the tests to which it was submitted, in a cylindrical section six inches long, was a pressure of 20,000 pounds to the square inch. It agreeably flattened out under this pressure to a large round sheet about an eighth of an inch thick. The pressure was removed. Slowly, inexorably, the sheet gathered itself together, pulled itself up until with a subatomic sigh, it regained its exact original size and shape, unimpaired.

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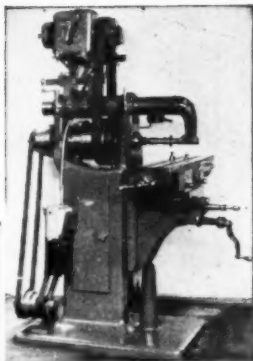
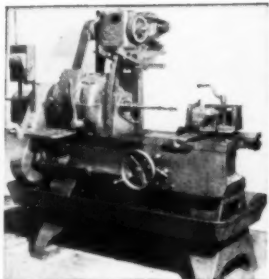
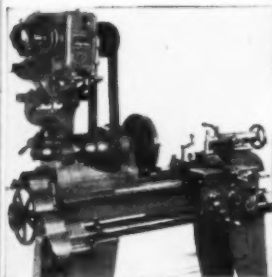
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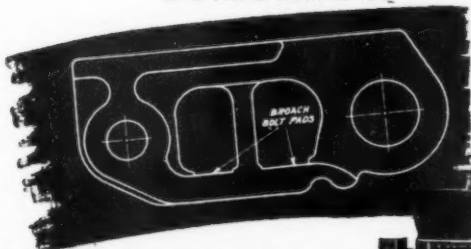


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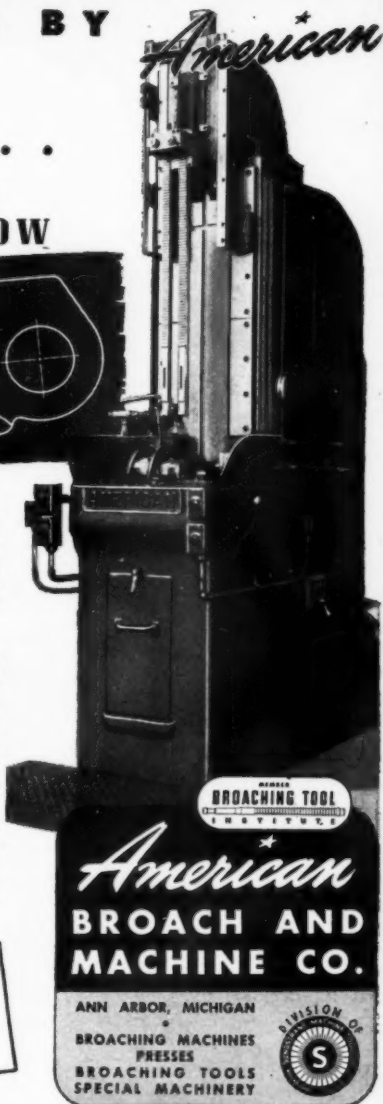
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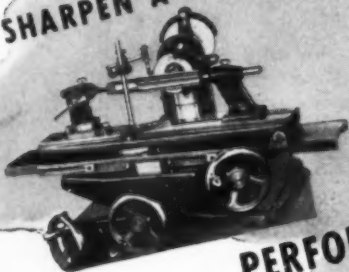
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ELECTRONIC DRILLING CONTROL

By P. D. AIRD

ELECTRONIC control — the “electric eye” of a thousand and one applications—has been successfully employed to control a difficult and delicate drilling operation in aluminum, thru utilization of the increase in the torque load in the drill spindle as activating agent in automatically withdrawing drill point from the work.

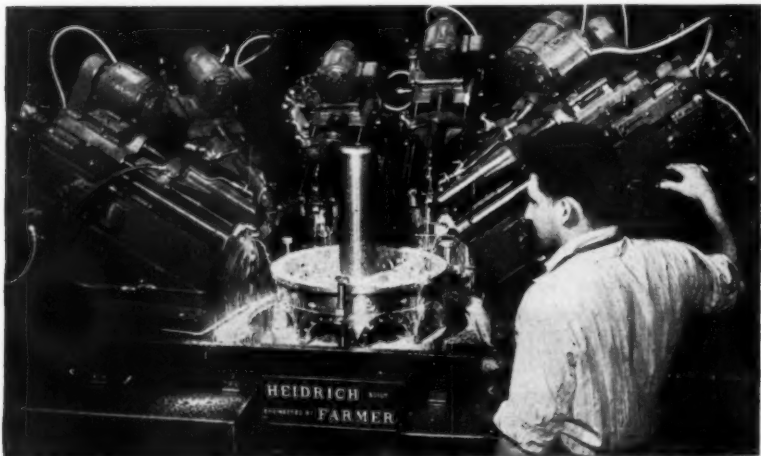
And since the degree of torque increase necessary to cause withdrawal can be set at any desired point, the electronic control provides a flexibility that readily enlarges the possibilities of this new device. Tho certain factors peculiar to work in aluminum were responsible for its employment here, the basic feature of torque control recommend its consideration in other applications.

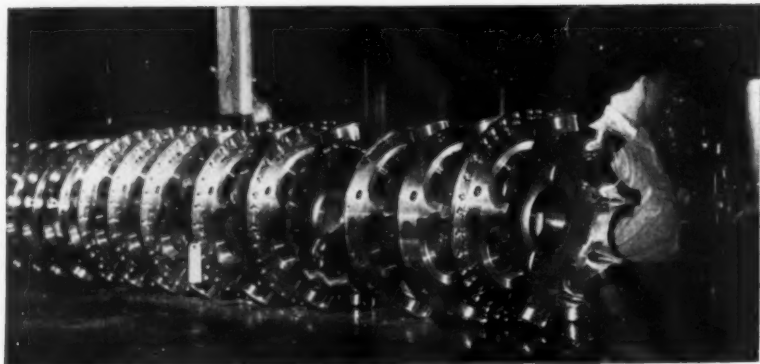
The machine designed for a certain specific operation at the Ford Motor Co.

plant in Dearborn. The crankcase half of the 2,000 hp, Pratt & Whitney engine on which Ford is a major contractor required 13 oil holes, 5/32" in diameter and 4" deep. The holes were to be drilled at regular intervals in the circumference of the aluminum casting. Furthermore, the holes were drilled at a difficult angle and this fact alone was sufficient to obviate possibility of using conventional drilling methods in this particular job.

At first a sensitive hand-operated drill press was employed, manned by an expert operator whose sense of feel and drilling experience provided the drilling control.

The operation was, under the most favorable circumstances, a slow and tedious one. Despite extreme care exercised by operators, Ford records show that one drill was broken to every 18 crankcase



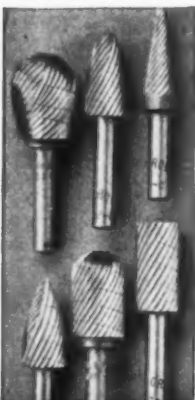


sections that were produced. Drilling time varied from 15 minutes, which was considered excellent, upward.

The conventional types of hydraulic control which can be set to a pre-determined figure did not seem adaptable to the job. Not only was the material tough, but because of clearances and an-

gles involved, it was necessary to use 10" drills. The end thrust in aluminum with a light drill, and the rapidity with which the flutes loaded, made breaks a constant hazard.

Studies by Ford technicians indicated that the increase in torque could be traced to two principal causes: (1)—loading

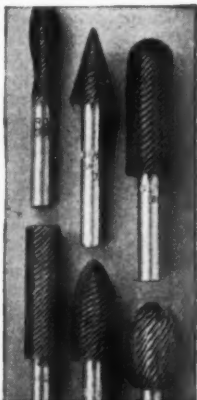


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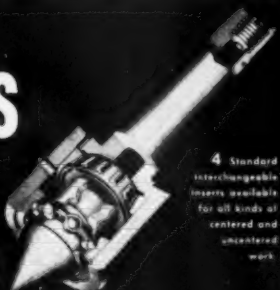
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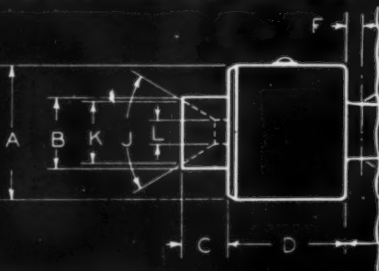
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of narrow flutes of the drill, occurring at a rate which could not be determined in advance, and (2)—dulling of the drill thru continued operation.

From these two considerations, experiments were undertaken with a view to controlling drill operations thru the increase in the torque load on the drill at a given point. Since neither the rate of increase in torque nor the point at which the increase occurred could be determined in advance, it was apparent that a control to operate successfully must be automatic in its operation. Since the operation was to be a multiple one, it meant that whatever control was designed, must operate independently with each drill.

Accordingly a six spindle indexing mechanism was designed, with each drill spindle operating independently and subject to independent individual control. The spindles were arranged in a semi-circular bank with spindles set at a fixed angle.

In the drilling operation, there were two limits, points at which drilling must automatically stop:—(1), the fixed depth of the hole, and (2), the point at which the amount of "twist" required to operate the drill spindle became such as to endanger the thin shank of the drill.

The first was simple; the second more difficult, but it was solved thru application of the principle of the electric eye—only in this case the torque load variations of the electric motor driving the drill were amplified thru vacuum tubes and made to operate control switches which in turn control the special functions in the process.

The switches control hydraulic pumps, limit mechanisms, retractable and advance slides as well as the actual drilling operation.

In operation, each drill head advances from its resting position at the crest of a slide to a position just short of the drilling area. This advance is accomplished rapidly, but when the drill reaches the outer limits of the drilling area, a limit switch automatically slows the drill to drilling speed.

Drilling continues at a normal feed rate until either excessive torque builds up in the drill point or the drilling limit is reached. In event the torque becomes



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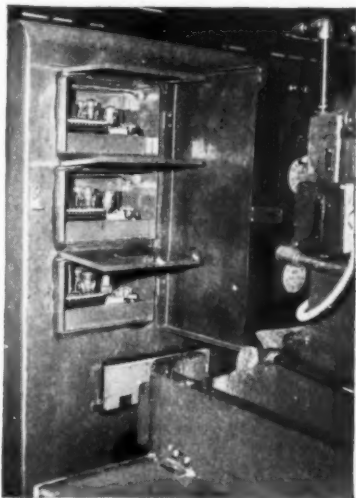
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PRECISION TAPPING EQUIPMENT

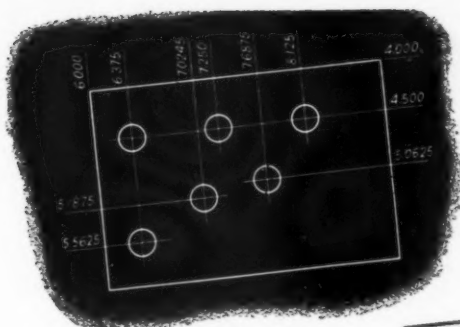
excessive, the added load variation in drill motor activates a vacuum tube. This in turn operates a relay which operates a hydraulic valve thru a solenoid switch. This retracts the drill to its original starting position where the rapid traverse and drilling cycle are repeated.

When the drill reaches a pre-determined depth, it contacts a second limit switch and is returned to the original starting position, setting the feed limit switch on its way back. This switch is mounted on a friction slide and during the drilling, is steadily pushed forward with advance of the drill.

A set-screw adjustment permits limit switch to be tripped to the feed rate $1/32"$ ahead of point where the drillhead slide picks up the friction slide on which the limit switch is mounted.

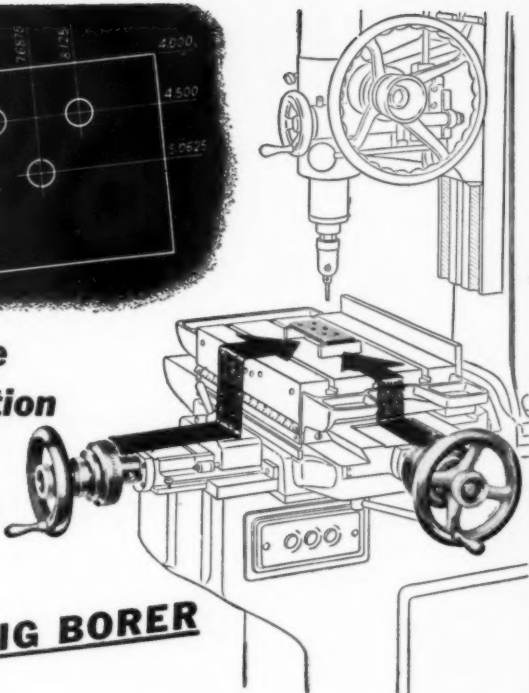


The electronic control operates on the principle of an unbalanced Wheatstone Bridge in which the galvanometer that detects flow of current across bridge is replaced by the grid circuit of the vacuum tube. By placing several tubes in series, variations in the grid pattern potential are made to operate a relay which



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in turn, operates solenoid switches of the valves in the hydraulic system.

Two sides of the bridge have fixed resistance. The third has an adjustable rheostat which, in this application, governs the torque range. The fourth is connected across leads of the driving motor.

Thru this device, voltage across the motor terminals is measured. As torque builds up, the rotor tends to slow down,

the current increases and the reactance of the motor and the voltage drop.

By adjustment of compensating rheostat, it is possible to activate the relay with one-inch-ounce in torque on the spindle. In practice it has been found that this is too delicate for ordinary operation and 10 per cent increase in torque load has been employed as the control margin.

To insure proper functioning thruout the drilling cycle, as time delay relay prevents torque control from operating until after the feed hydraulic circuit is activated thru the elementary effects of both high starting and low load motor characteristics.

Master control of the operation is in a cycle switch on the instrument panel where controls for various circuits in the operation are grouped.

The cycle elevates the table on which the part is clamped, and at the same time starts the drill motors. Auxiliary slides carry the drill heads to the face of the work where drilling begins.

When each of the six drills in the fixture has completed its depth, the part being drilled is indexed 120 degrees. When the indexing has occurred twice, the circuit of holes in the crankcase is completed.

Each drilling unit is complete in itself with a $\frac{1}{4}$ hp motor, hydraulic pump and control panel. A separate hydraulic circuit governs the elevating and the indexing of the press table.

In the 6 months that the machines have been in operation at Ford, it has been possible to obtain data on their operation. Time of drilling has been cut from 15 to four minutes and drill breakage has practically disappeared.

The use of the system has been particularly interesting in the operation for which it was primarily designed, the principle of electronic torque control is capable of still further application. In fact Heidrich and Farmer, builders of the Ford machines are at work on a tapping machine. In this application a reversible motor replaces the retracting mechanism employed in the drill press and a signal light indicates to the operator that the drill is dull when torque increases beyond a certain set limit.



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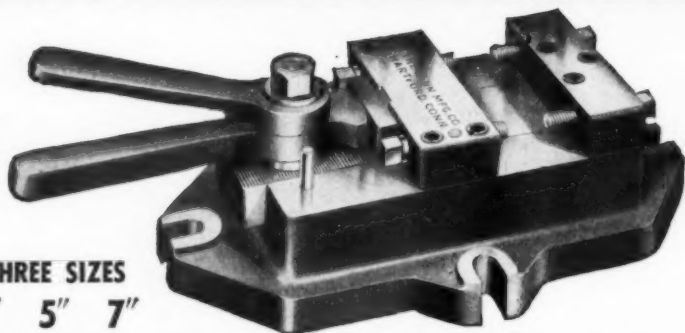
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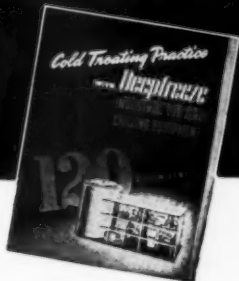
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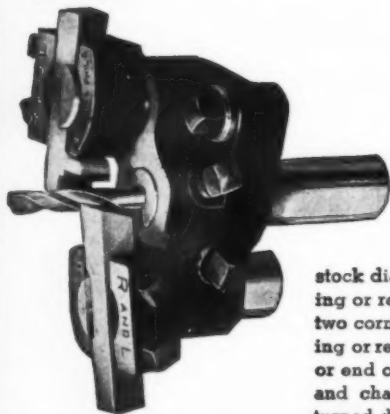
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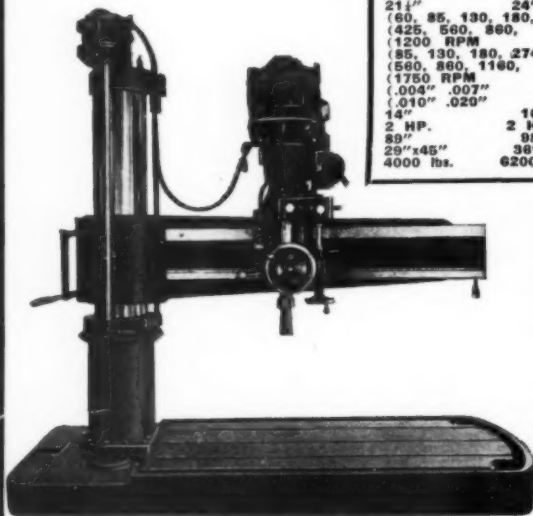
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9 1/2"	9 1/2"	9 1/2"
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25 1/2"	36 1/2"	48 1/2"
21 1/2"	24"	22"
(60, 85, 130, 180, 425, 560, 860, 1200 RPM		on all models
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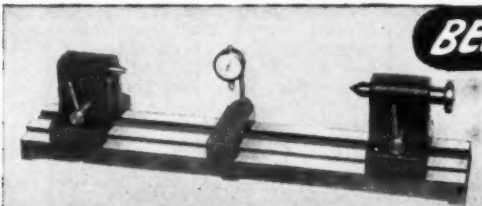
By Edmund Mottershead

REDUCING THE WASTE OF IDEAS

BEHIND the waste of manpower, of machines and equipment, of materials, very often lies a fundamental situation . . . the waste of ideas. The foremen admittedly have many things on their minds. They have a sizeable task to keep things going with the methods and procedures already established. While part of their job is to search continually for better ways of doing things, they cannot give much time to such activity. The workers themselves have often seen a new idea result in a new process which ended up by having two or three men perform the work of eight or 10, the newly unnecessary men being discharged. They have seen improved methods which they discovered, result in rate cutting on piece work jobs to the point that they ended up by working harder for less pay. If we can solve the problem of getting the men to bring in ideas, to submit suggestions, to think and be alert all the time, we have solved the basic problem of continued profits and continued useful service on the part of the company to society.

One of the first things you can do, of course, is to ask the men directly for suggestions on various problems as they come up. This sometimes needs a little build up, for example . . . "Bill, we're planning to run 5,000 special sections thru here next week, and the crux of the job will be getting the joints made as accurately as possible. Now you're one of the best operators we have, and you could probably do most of it, if not all of it yourself, but I hate to pull you off the job you're working on now. You've been working pretty close to these other fellows here, and maybe one of them could do the work well enough, or maybe one of them could do what you're doing right now. What do you suggest?" So Bill thinks it over and gives you his idea. He feels good for a little pat on the back, and really tells you his opinion.

The next, and really important thing you must do is to **ACT** on his suggestion and let him know about it as soon as possible. Men get tired of coming up



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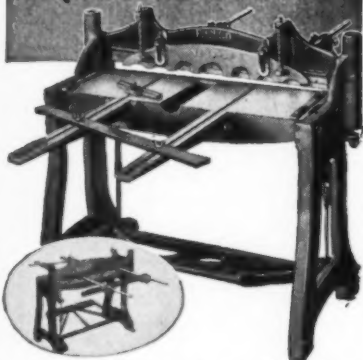
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with ideas when they see that sooner or later, none of their ideas are ever acted upon or get any attention.

The third step is to see that Bill gets full credit with **your superiors** for his idea . . . if it works . . . and that Bill finds that out also. If the idea doesn't work, it was your own idea anyway, so let's forget all about it.

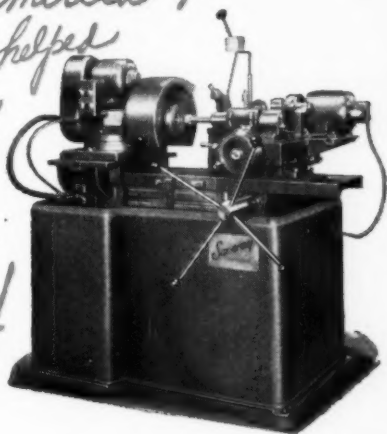
When a suggestion is definitely rejected, however, don't just ignore it, or tell the worker you simply can't do the thing that way. Sure, you may have thought of it yourself. The boss may have thought of it too. Twenty years ago, maybe several hundred experiences have proved the idea is no good. BUT, for Bill, the worker, that idea is right now original with him and his very particular pet baby. It should be treated tenderly. So simply explain that you appreciate his suggestion, but that for such and such reasons it doesn't work out. If he has another idea, he should bring it in tho; you're always glad to have ideas, and you'll see that he gets the credit for the one that works.

So much for the moment for what you can do immediately to encourage the men to make suggestions. Now let's consider briefly the **systems** for getting suggestions from employees.

A few years ago the Metropolitan Life Insurance Co., published a report containing an analysis of the employee suggestion systems of more than 100 companies. These plans, according to the report, served as a direct source of ideas which were of benefit to the firms, and also had the effect of stimulating the interest of the employees in the work of their companies and of improving the general morale. Thru encouraging employees to think, excellent ground work was laid for training, and some of the firms which follow the policy of filling higher offices from the ranks of the present working force used the suggestion system as one guide to eligibility for advancement.

There are, roughly speaking, three types of suggestion systems: — contest, continuous, and a combination of the two. In the continuous type, suggestions may

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be made at any time, while in the contest type, the submission of suggestions is limited to a definite period. Many people believe that the limiting of time for submission increases both the quality and quantity of ideas. It is also thought that under the continuous type, interest tends to decline after the plan has been in operation for some time.

Suggestions found to be worth while are usually paid for in cash, but some companies make other awards, such as certificates, photographs, jewelry, banners, departmental flags, and sometimes both cash and various prizes. The amounts of the cash awards usually vary according to the value of the suggestion, frequently being fixed at a definite percentage of the calculated savings for the first year in which the suggestion is put to use. Where the saving is intangible and hard to measure, the rewards are made according to the grade and quality of the suggestion. Most plans endeavor to reduce the length of time between submission of the ideas and payment of the rewards to the minimum consistent with proper investigation of the idea, although some companies make an annual event of presenting awards for suggestions along with various other bonuses. It has been found that the percentage of acceptable suggestions ranges in one company from 20% to as high as 50% of the ideas submitted.

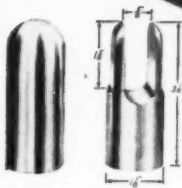
Most of the companies that conduct such systems hope for the uncovering of profitable ideas. It has been found, however, that the intangible benefits often outweigh by far in improved employee morale the direct profits derived. Suggestions relative to working conditions, public relations and labor relations policies have been especially helpful.

Thru all of the suggestion systems, one thing is of definite importance . . . that the acceptable ideas be given adequate recognition and publicity within the organization. For your part, as foreman, in foreman's meetings or thru other channels, you can urge the adoption of some such system and dovetail it into the day-to-day suggestions that come from the men themselves.

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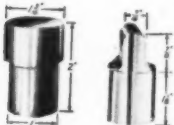


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However, humans being what they are, with suggestion systems as with other aspects of the foreman's job, there are various problems that continually come up. As an aid to your better handling of these situations in your own plant, a few of them are mentioned hereafter, together with some suggestions for meeting them successfully.

Sometimes foremen question the basic need for giving special attention to proper methods of handling suggestions; they fail to see the need for paying any attention to the matter. In the first place, with many other things to think about, the foreman should know how to handle them effectively if at all. Secondly, if the volume of suggestions increases materially, he should be able to handle them systematically and satisfactorily to all concerned so that in the future he may be able to train someone to take over that part of his work. But first and foremost, it is essential that he know how to receive and reject suggestions without offending the workers and cutting off the sources of ideas.

Some foremen question whether or not the individual worker is really able to offer practical suggestions for methods and working conditions. Because of his intimate knowledge of the job, and the conditions under which he performs it, the individual worker who is analytically inclined can and frequently does offer valuable suggestions for improving both methods and conditions. Some few workers are hesitant about it because they fear they will suggest themselves out of a job, and it is up to the foreman to see that this fear is dispelled by providing quick and adequate compensation and recognition for suggestions made by workers.

Many times a new employee enters the plan, and in his curiosity starts to ask why things are not done so-and-so instead of as they are being done. Naturally, there is a certain amount of resentment at the newcomer shooting off his face. The fact is however, that if the foreman can hold the new worker down on his talk long enough for the newcomer to really get acquainted with the shop and its problems, and at the same time keep him in

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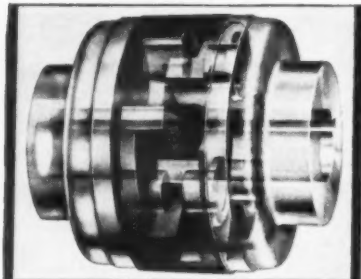
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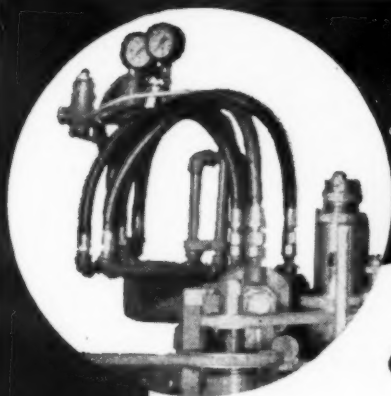
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the right frame of mind to go on making suggestions as he learns more, the foreman will keep open another source of ideas, and will be able to develop a man who is potential executive material for later on.

Another difficulty which foremen often feel they face where there is a line-and-staff type of organization, is the "interference" and "meddling" of the staff specialists as they make suggestions for better operation of their departments. The foreman should combine his own intimate knowledge of his practical operating problems with the specialized knowledge which the staff specialists afford, and work cooperatively with them in the development of suggestions for improvement which, after thoro preliminary discussion, seem practical to both parties.

When a suggested improvement has been tried out and proved unsuccessful, many men instinctively throw it out and forget all about it. However, if nothing more, at least some simple record could be kept of the attempt for future reference, outlining the proposal, the circumstances under which it operated and why it failed. However, if the foreman thought in the first place that the idea had sufficient merit to try it out, his real attitude should be that of re-analyzing not only the idea but also the conditions affecting its operation so that if it is worth doing at all, he may be able to make it work with more adaptations.

Another question that sometimes arises in the minds of the foremen is just what the reaction of management will be towards foremen whose operators are constantly sending in suggested improvements in the methods which he has established. There is, of course, the possibility that if this takes the form of a major epidemic of suggestions, the management may want to know why the foreman did not establish effective methods in the first place. However, the more likely result is that management tends to recognize it is always possible to improve existing conditions and that the foreman who can encourage his men to offer worth-while suggestions is showing qualities of true leadership in handling his job.



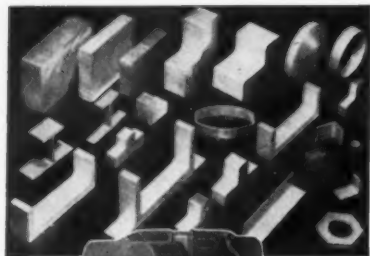
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The chief value of any suggestion system is that it tends to stimulate worker alertness to possible improvements. It serves to stimulate worker efficiency, and results in bringing to the attention of management, the persons who are of the proper calibre for advancement. If every person in the plant will think and observe, many of the other problems of waste and production will be licked by the joint effort.

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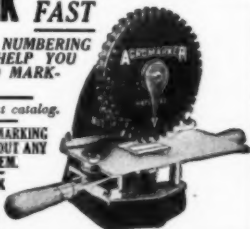
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YOUR TAX PROBLEMS

INVESTED CAPITAL

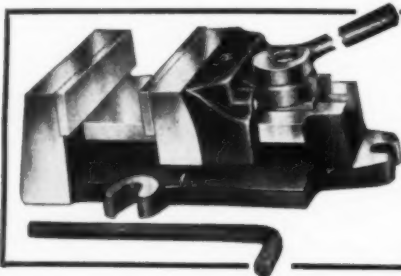
By ARTHUR ROBERTS

"IF I enter a charge for interest on invested capital in my costs, can I deduct it as an expense on my income tax return?", is a question which users of machine tools frequently ask. Interest calculated for cost-keeping or other purposes, on account of capital or surplus invested in a business, which is not a charge arising from an interest-bearing obligation, cannot be deducted from gross income on the tax return.

Even among accountants, the charging of interest on invested capital is a moot question. Some businessmen do not make this charge; others do. Some authorities question the fact that a business should pay interest on the investment, contending that the profit on sales is all business should be expected to produce. Proponents state that a business must pay interest on borrowed capital, so why not

pay on the investment in a business? Dissenters contend that borrowed capital does not also receive profits and therefore is not in the same category with interest on business investment. Some businessmen enter the charge in costs on the contention that they could get six per cent interest on their money if they invested it in another enterprise. Hence, their own business should pay in excess of this percentage and the only way to assure this is to cost sales to include interest on invested capital.

Where different departments are in operation, the capital invested in each department will differ; hence, one reason advanced for the inclusion of interest on investment in costs is that it enables the management to measure the relative efficiency of each department. Opponents state that it is not necessary to include



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Eccentric motion moves jaw 5/16".

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Chicago 12, Ill.

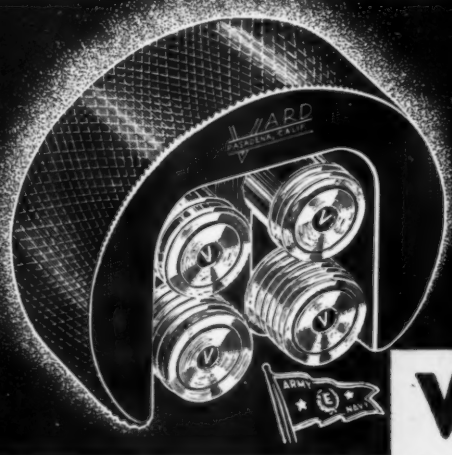
A detailed black and white photograph of the Vard Model VC Roll Thread Snap Gage. The main component is a large, semi-circular frame with a central opening. Several smaller components, including gage rolls and pins, are arranged around the frame. The frame has markings such as "GO 1928 P 05" and "NO 1928 P 05".

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We can show you the works of the VARD Model VC Roll Thread Snap Gage, but pictures can never tell how much this gage can speed up your inspection of small threaded parts. Instead of screwing a pair of ring gages on and off the work, one pass of the threaded part through the gage rolls will instantly show up inaccuracies in lead, thread form, pitch diameter, roundness and straightness. Correctly cut threads should pass through the GO gage rolls and not pass the NO GO gage rolls. This gage fits into the hand or can be held in a stand.

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Gage frame machined from block of steel. Sharp machine knurled grip. Tool steel gage rolls, hardened, ground and lapped. Eccentric pins permit adjustment for wear. Lock-nuts hold setting securely.

A close-up, high-contrast black and white photograph showing the internal gage rolls of the snap gage. The rolls are cylindrical with a fine, knurled texture. The Vard logo is visible on one of the rolls.

MADE IN SIZES TO GAGE THREADS
FROM NO. 0 TO NO. 12, AND IN ALL
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A logo for Vard Inc. featuring a stylized flag with the word "ARMY" on the left, a circular emblem in the center, and the word "NAVY" on the right.

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this charge in costs to measure relative efficiency; that the fixed charges which will differ in accordance with departmental investment, will provide ample proof of comparative efficiency. Another objection is that interest on investment charged in costs eventually is charged to the inventory accounts, inflating the stock on hand with anticipated profits that may never materialize, particularly at a time when the price level is downward.

Interest on investment is not an actual outlay, hence, not a cost, say objectionists and they seem to be backed by sound accounting procedure in this contention. It is considered sound accounting practice to record actual costs and altho the income tax law does not always square with conservative accounting practices, in this instance, it conforms, because regulations usually consider only actual outgo as expense within the period. In a number of cases, the taxpayer is not permitted to deduct actual costs or losses if he does not take the deductions in the periods they occur. Bad debts, for example, must be deducted in the year they are ascertained worthless, otherwise, the deduction may not be allowed. Depreciation, too, must be taken in the period it occurs. You can't take a deduction in subsequent years for depreciation you failed to take in prior years when the wear and tear actually took place. Users of machine tools often lose out on such omissions and with the tax rate in the clouds today, they should watch this tax angle most carefully.

We are not taking sides pro or con but the machine tool user should understand all angles of the subject, otherwise, it may lead him into muddy waters on earnings and tax. In a locality where competition is keen, or in an industry where sellers must figure close to get business, the organization that does not include interest on investment in costs, can sell for less or quote lower prices than the organization listing this charge. If the capital invested is high; if it approximates or exceeds annual sales volume, then the inclusion of this cost may increase selling prices more than five percent. Today, with materials and manpower scarce, with money abundant, this differential may not affect sales adversely, but we may have a buyer's market some-



ly. Sawyers speed production of accurate, choice cuttings, well-selected to avoid flaw-scrap and spoilage.

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- This specially designed light casts a definite shadow-line upon the material to be sawed, showing the exact path of the saw before the cut is made. The light is installed and focused for each rip-saw, individual-

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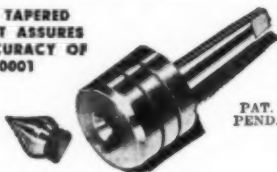
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- C. Extra wide point for large diameter work
- D. Standard point
- E. Blank made of soft tool steel for nests
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day. Then higher selling prices, because interest on investment is included in costs, may curtail sales.

The usual bookkeeping routine is to enter interest on investment in operating costs, and credit an account called "Interest Charged to Cost", which is considered the same as an income account. At the end of the fiscal period, this credit is transferred to Surplus. Profits are therefore increased indirectly by the amount of this cost, and altho you can't deduct it as an expense on the income tax return, you must pay a tax on the additional income earned thereby. Some businessmen consider interest on investment by merely listing it on the profit and loss statement to determine the net after deducting this charge. Because the charge is not entered in costs, this does not increase profits, inasmuch as it is not considered when setting selling prices.

Of course, if the capital invested in a business is small compared to sales volume annually, this charge may make little difference in costs or selling prices, but where the invested capital is substantial, the inclusion of capital investment in costs may "up" selling prices substantially. A user of machine tools may find it difficult to sell against competition in slump years, if he is heavily capitalized, because sales may decrease to a point where they approximate invested capital and interest on capital investment, usually computed at six percent, may run high, necessitating a heavy charge to each unit of production. The whole procedure is more or less artificial.

Interest on investment is computed on the net worth for a proprietorship or partnership, or the capital plus the surplus for a corporation. The machine tool user must be sure that his net worth is computed accurately if he charges interest on investment in his costs, otherwise, he will compute this expense too high or too low.

All interest paid on personal or business indebtedness is, however, deductible with a few exceptions that the taxpayer should understand. If on an accrual basis, all interest paid or accrued during the year is deductible, but taxpayers filing on a cash basis may not deduct interest unless it is actually paid during the year.

A step in the process of building Hendey Precision-Production Lathes. One of many operations which insure the high character of every Lathe manufactured by us.



Inspector checking the size of bored hole in rear housing of headstock casting. In this housing the anti-friction bearings for end of spindle are mounted. This calls for fitting in tenths.

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Interest on a lien or mortgage is deductible but if the taxpayer pays mortgage interest for another, it is not deductible on his return because it represents a gift. Finance charges on installment purchases are not deductible if the interest is not itemized separately. The interest on a tax delinquency is deductible but the penalty is not deductible. Interest paid by a corporation on scrip dividends is an allowable deduction. So-called interest on preferred stock, which is actually a dividend, is not deductible.

The taxpayer must report interest earned on loans, mortgages, saving bank deposits, matured bond coupons, even those which have not been deposited, and interest earned by discounting notes, which is income when the note is paid off, not when it is discounted.

The taxpayer owning government securities should know where he stands in reporting interest thereon for income tax purposes. Some securities are fully exempt from taxation on interest received; others exempt from normal tax but subject to surtax; others subject to normal tax and surtax.

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6523 Carnegie Ave., Cleveland 3, Ohio

**COOLANT
PUMPS**



**BY-PASS
VALVES**



Model AOR

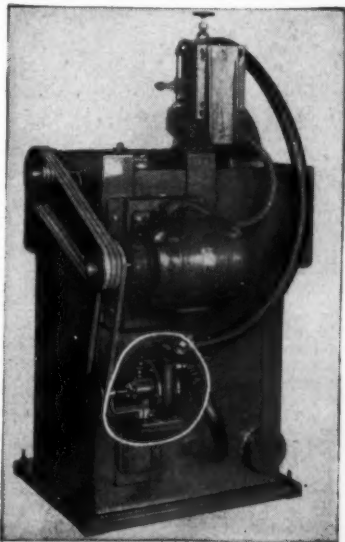
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WITH DUSTKOPS

CUT-IN DUSTKOPS DURING A "CUT-BACK"



When only a few grinders are in operation, shut down the centralized dust collecting system and save enough power costs to pay for the Dustkops.

Dustkops are unit type dust collectors—highly portable, easily installed (usually without tools), quickly obtained—will solve the "interim dust collecting problem" during a change-over.

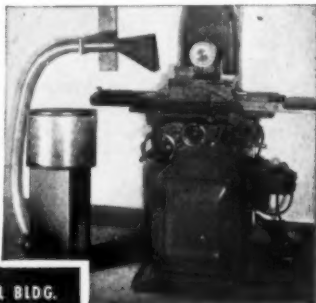
The bigger your plant, the quicker Dustkops will pay for themselves.

Don't remove the main duct; install a DUSTKOP around-the-corner. The compact Dustkop can be moved when the grinder is shut down.



Here's how to support the flexible metal hose that connects the wheelhood to Model 950 Dustkop for a Surface Grinder.

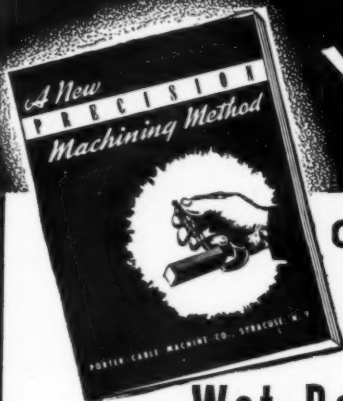
Laboratory Model PS-1 DUSTKOP will stop dust, lint, and filings. A removable tray is for sludge from wet grinding.



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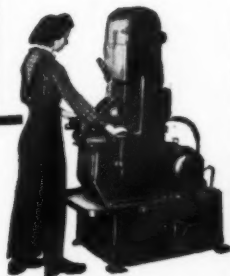
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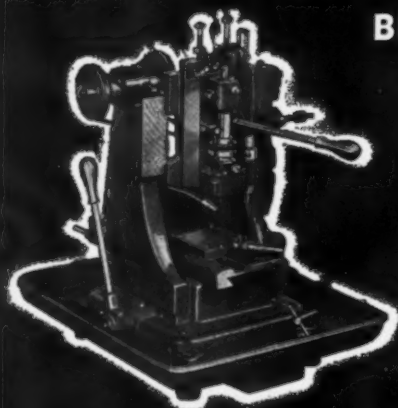
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FOR SMALL PROFILING, MILLING, SLOTTING,
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SPECIFICATIONS

Working area:

2" x 4" horizontal, 1 1/4" vertical

Fixture block: 4" x 4" x 1/2"

Work surface of table: 4 1/4" x 4"

Travel of vertical slide: 1 1/4"

Travel of table: 4 1/2"

Travel of cross slide: 2"

Cutting tool collet: Any standard size up to 5/16" dia. Standard 1/4" collet supplied unless otherwise specified.

Distance of table to nose of spindle, when down: 2 3/4"

Center distance, cutter spindle to follower: Approx. 2-1/16"

Follower cutter spindle: No. 2 B&S taper

Motor: Standard 1/4 h.p., 3-phase

Speeds: Four speeds ranging from 1000 to 8000 RPM

Dimensions: 19" wide, 24" long, 9 22" high.

Weight: Net, 260 lbs., boxed, 285 lbs.

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For Precision, Versatility
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You can do a wide range of precision work with this Wade Motor Driven Bench Profiler . . . work such as profiling, milling, slotting, recessing and routing operations . . . on a variety of small parts such as watch and clock plates, clock mechanisms, mechanical time fuses, parts for small firearms, range finder parts, typewriter and adding machine parts, etc.

It is a precision built profiler for production work. Women and unskilled help can quickly become expert in its operation and turn out duplicate precision work within exceedingly close tolerances.

The Wade Bench Profiler is a time and money saver . . . a small, moderately priced machine tool that will pay for itself over and over in your production line.

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No. 1 Size—1/2" capacity in cast iron.

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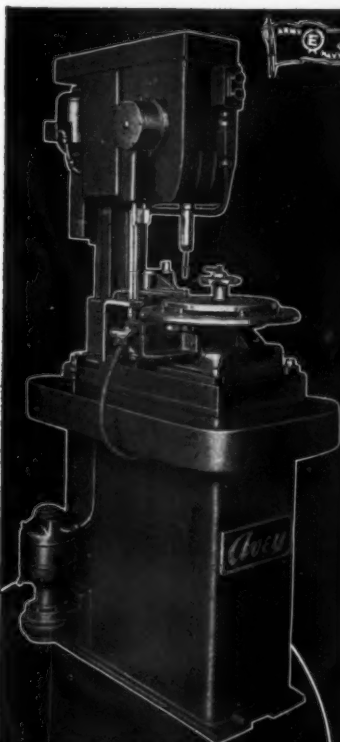
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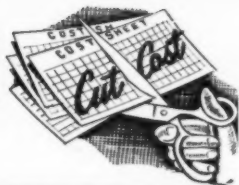
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How much of your vital machine production time is given to preparatory work and set-ups? Chances are that much of this time could be saved through the use of Rousselle equipment.

In these days, when time is more than money, Ross offers you these time-saving Rousselle tools: Production Vises, $4\frac{1}{2}$ -inch to 13-inch capacity, swivel or stationary base; Punch Presses in three sizes, $4\frac{1}{4}$ -ton, 10-ton and 15-ton capacities; and quick-set Adjustable Milling Spacers in a wide range of sizes.

Take advantage of our free advisory service. A telegram, letter or phone call will bring prompt response.

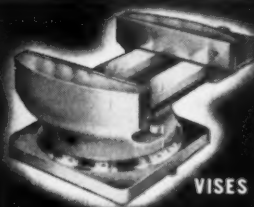
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DAVID J. ROSS COMPANY

BENTON HARBOR, MICHIGAN

TINY SCREW ASSEMBLIES

By CARLETON CLEVELAND

A PROBLEM that has long been a vexing one, if not a veritable bottleneck on the production line, has been the annoyance occasioned by the setting of screws and nuts in assembly work. This has been doubly vexatious when the screw or nut assembly has been in some



Filling Sorting-Tray with screws.

narrow space, far corner, or inaccessible or hard-to-get-at place. Often tiny screws must be inserted in close clearances between binding posts and the placing, starting, and running of small screws by hand is a slow and tedious procedure.

In many such cases, a Pix-up Finder and Adjusto-Tray has been found to simplify such assembly operations and worth while production increases are frequently shown. With this device, screws are sorted, held in "heads-up" position, picked up entirely by mechanical (not magnetic) action, placed, and driven, in what might well be classed as a single operation. No longer is it necessary to pick up a screw with one hand; fumble it around in the fingers to get it in the right position for insertion; reaching into a tight narrow space; and after the screw is in place, pick up a power-driven tool with the other hand; getting the bit into the slot in the head of the screw and running it home.

As a typical example, in the assembly of a coin-operated machine, the installation of a small contact plate required the setting of some 26 screws. Four operators, each picking up screws by hand and setting them with power screw drivers



Picking up screw with finder attachment on power tool.

Universal Drill Bushings save valuable tool drills. Because they are straight and round and have



super-finished bores, Universal Drill Bushings insure accuracy and possess unexcelled wearing qualities. Tough, precision-made. Write today for further facts about Universal Drill Bushings, Collet Chucks, Floating Chucks and MIKRO-LOK Boring Bars.

UNIVERSAL ENGINEERING
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Starting and running screw into place in one operation.

were unable to keep up with production requirements; while, on a try-out, one operator, using the finder and tray unit, was able to meet production demands, doing more than the other four operators combined.

In another instance, a manufacturer of sewing machines found that operators had considerable difficulty applying hardware inside the wood drawers of the cabinets. When driving the screws by hand, it was almost impossible to start them properly. With the finder, the work proceeded without loss of time.

The finder unit, a spring-hardened, extension type, having three slots lengthwise, replaces the standard finder in the screw driving attachment. Inside the lower end, the finder is recessed to fit the particular size and type of screw to be driven. Over the finder is a sleeve having a clearance of only 1-100th of an inch, so that as a screw is picked up, the finder cannot spread beyond the necessary allowance for entrance of the screw head. The tray is slotted, of sheet steel with flanged sides and ends, and spring mounted on a cast iron base—occupying 4"x5½" of bench space—and adjustable by means of clamp screws at each corner for the



DRILL JIG BUSHINGS? Here's a handy source of information. EX-CELL-O's two-color bulletin designed to save you time and trouble in selecting your bushing requirements. It's packed with practical data for purchaser and designer. It's printed on extra-heavy stock to give long, useful service. Send for your free copy today. Ask for EX-CELL-O Bulletin 11882-A.

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Precision MACHINE TOOLS • CUTTING
TOOLS • AIRCRAFT AND MISCELLANEOUS PARTS



HACK SAW BLADES LAST LONGER

After Capewell Field Engineer
Analyzes Tool and Die Job

More cuts per blade were secured by an Eastern tool and die shop. Previously this concern had presented no information to a Capewell Field Engineer. He, in turn, studied the size and characteristics of the screws being cut, and recommended the Capewell hack saw blade best suited to cut costs on this particular job. An extended run then showed longer life and lower blade cost.

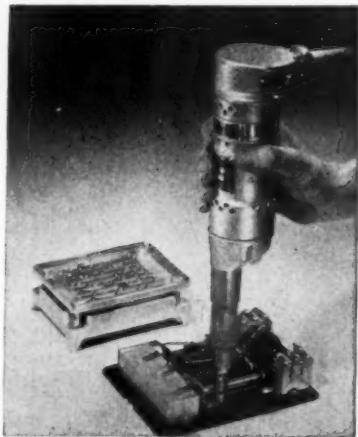
Perhaps your own saving costs are not as low as they should be. Better talk to your local Capewell hack and saw distributor.

THE CAPEWELL MFG. CO.
Hartford 2, Conn.



The trend is to **TECHNITE**, the molybdenum high speed hack saw blade

accommodation of the particular length of screws to be used. Adjustment of the distance which the tray depresses, to allow finder to grasp the screw heads, is controlled by four stop screws diagonally located in the base. Into this tray, a quantity of screws are spilled. A slight shaking causes the screws to drop into the series of slots, where they rest sus-



Close-up view of tray and finder.

pended with heads above the slots ready to be picked up by the finder.

No longer need workers fumble away costly seconds in screw driving—picking up, straightening, and then guiding the screws. A power screw driver, equipped with the finder is merely placed over a screw head, and pressed. This causes the screwhead to be firmly gripped in proper alignment and held ready for the driving operation. Inserting screws with a Pix-Up Finder and Adjusto Tray is a one-hand operation.

In a plant manufacturing electric appliances, when assembling base plates as a part of the housing of small electric motors of fractional horsepower capacity, the base plate holes were located deep in the motor base and close to the flanges, which made it very difficult to start the screws by hand. Here again the prob-



Part of the battery of ten Michigan 861-4B fine pitch gear finishing machines.

Fine pitch gears **IN MASS PRODUCTION SHAVED TO TENTHS OF A THOUSANDTH ON MICHIGANS!**

A leading producer of mechanical aircraft gun directors has found it possible to hold extremely close tolerances for tooth spacing, involute, and pitch diameter on fine pitch gears while using relatively unskilled labor for the finishing operations.

The same machine types (Ten Michigans 861-4B) are used for finishing all the spur and helical gears in this mechanical gun director—the gears ranging from $\frac{1}{4}$ inch to 4 inch diameter, 32 pitch and finer—each assembly having some 750 gears.

Moreover, burnishing—at first considered necessary on gears for such mechanisms—has been found unnecessary with the high finish provided by the Michigan shaving machines.



Automatic accuracy is built into the Michigan 861-4B and Michigan crossed axis cutters.

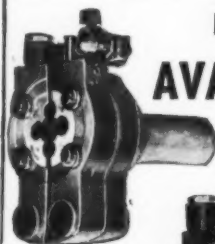


MICHIGAN TOOL COMPANY

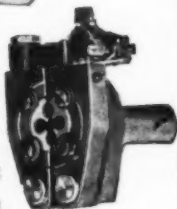
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Instantly set from a rough cut to a finish cut of thread.

Button dies quickly changed.

Less set-up time. Low cost.

Accurate speedy thread cutting is assured with these DIE HEADS. A wide range of capacity of each size die head means a small investment, and makes this modern DIE HEAD the ideal general purpose thread cutting tool. For tough threading jobs where constant uninterrupted operations are essential, the BHICO DIE HEAD will do them.

No fussy adjustments to be made; Dies removed by loosening of two screws.

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lem was solved and the production increased by 25 per cent.

At one of the ordnance plants this equipment is used in fuse assembly where the screws must be driven into the shells to secure the fuses. Restricted clearance to get the screws started formerly required guides to be placed into the holes to line up the screws. This necessitated changing of guides for each unit, causing considerable waste of time. Now the job is easily accomplished and production increased by 25 per cent.

In another type of shell there was an obstruction and the set screws very short, which caused much difficulty. However, the problem is now solved and the work speeded up considerably.

It matters not what type of screw is being used,—round, flat, oval, or binding head; nor is the use of the finder and sorting tray limited solely to the application of screws. Where screws with lock-washers are used, they may be obtained as single units and run into place the same as screws, eliminating the waste time of picking up washers and fitting them on the screws. Self-tapping sheet metal screws, having hex heads are handled in the same type of tray and socket type finder.

(Pictures—Courtesy Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago.)

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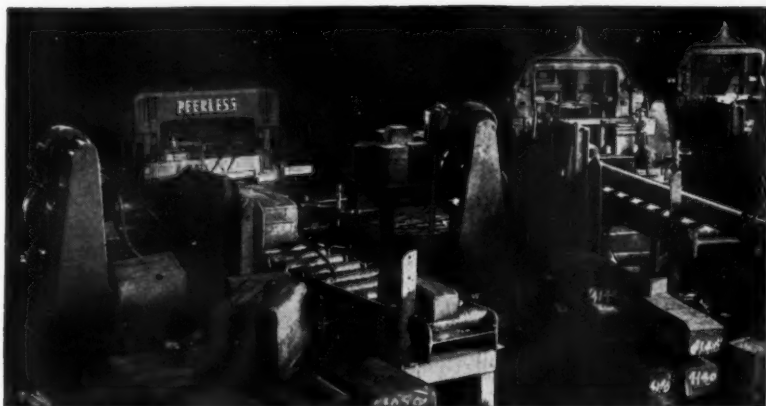
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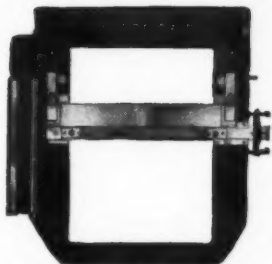


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Massive Four-Sided Saw-Frame surrounds blade and the work, permitting bearings above and below Saw Blade.

Precision sawing at higher speeds, with longer blade life and no surface hardening, results from the use of Peerless Hydra-Cut Metal Sawing Machines. Taking as little as $1/16$ " of material for the cut, Peerless gives you more usable parts per billet, bar or tube. The blade is good for 2,000 sq. in. As little as .005 need be allowed for finishing.

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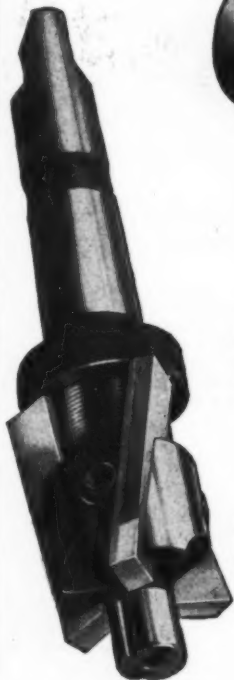
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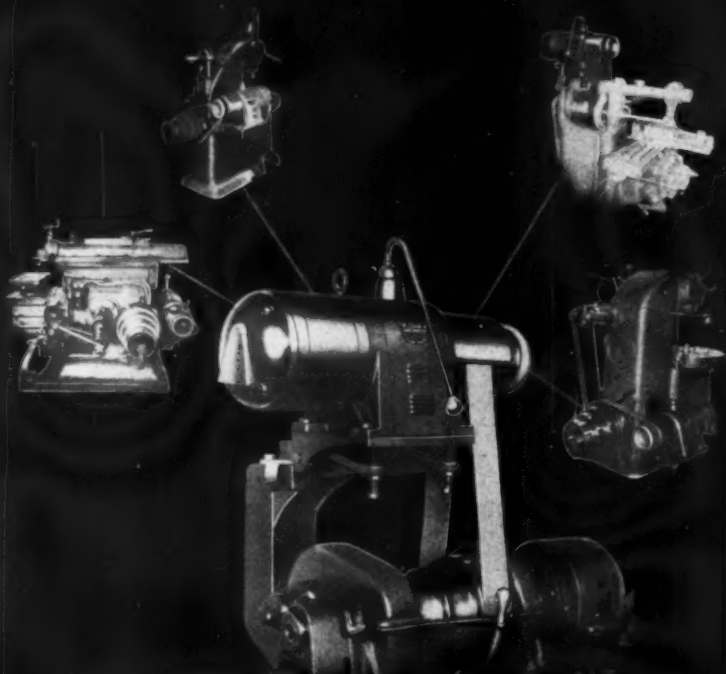
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By W. J. CURRY

ELABORATE drawings and designs are not always necessary when new tools, fixtures, or dies are needed—especially if they are to be used for limited manufacturing purposes. Often adequate tools can be obtained in shorter time and at much lower cost simply by assigning the jobs to ingenious mechanics who will design, develop, and test the tools without drawings, and frequently with very little machining.

The accompanying illustrations show a few of the low cost tools designed and built by Michael Reichlin, a methods

man at General Electric's Lynn River Works.

Fig. 1 shows a soft-steel die which has been used successfully for about three years to form $\frac{3}{4}$ " steel plates. The product is shown between the two sections of the die, and the wood blocks were inserted merely for photographic purposes. This work piece is formed of a $\frac{3}{4}$ " steel plate which is too heavy in section for conventional bending tools available. The only machine work necessary on the dies consists of the tapped holes and bevels on the lower section. When the



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DO YOU WANT TO SHARPEN . . .

. . . broaches up to 84" long?

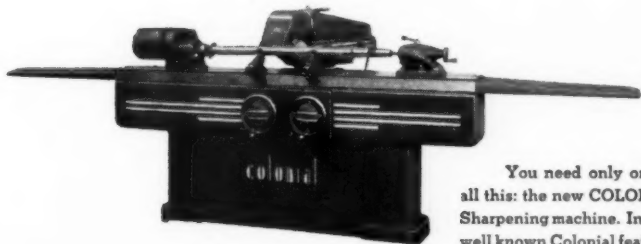
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. . . WITH WOMEN OPERATORS?



You need only one machine to do all this: the new COLONIAL CS2 Broach Sharpening machine. In addition to all the well known Colonial features, you will find on this machine such important features as:

Full anti-friction double-row roller action to guide the sliding head plus use of light-weight alloy castings for the moving head, reducing weight to 1/3 that required with iron or steel construction. These two features provide a surprising ease of sharpener operation. To maintain this ease for life, moreover, all anti-friction bearings are completely sealed against entry of dust.

Where floor space is at a premium, a special roller curtain design (to protect ways of machine) enables, at slight additional cost, a reduction of 6 ft. in total floor space required for the machine when sharpening maximum length broaches.

Also available as extra equipment are double-ratio micrometer hand wheels to control feed to the ten-thousandth of an inch. Makes possible maintaining identical step per tooth in regrinding broaches.

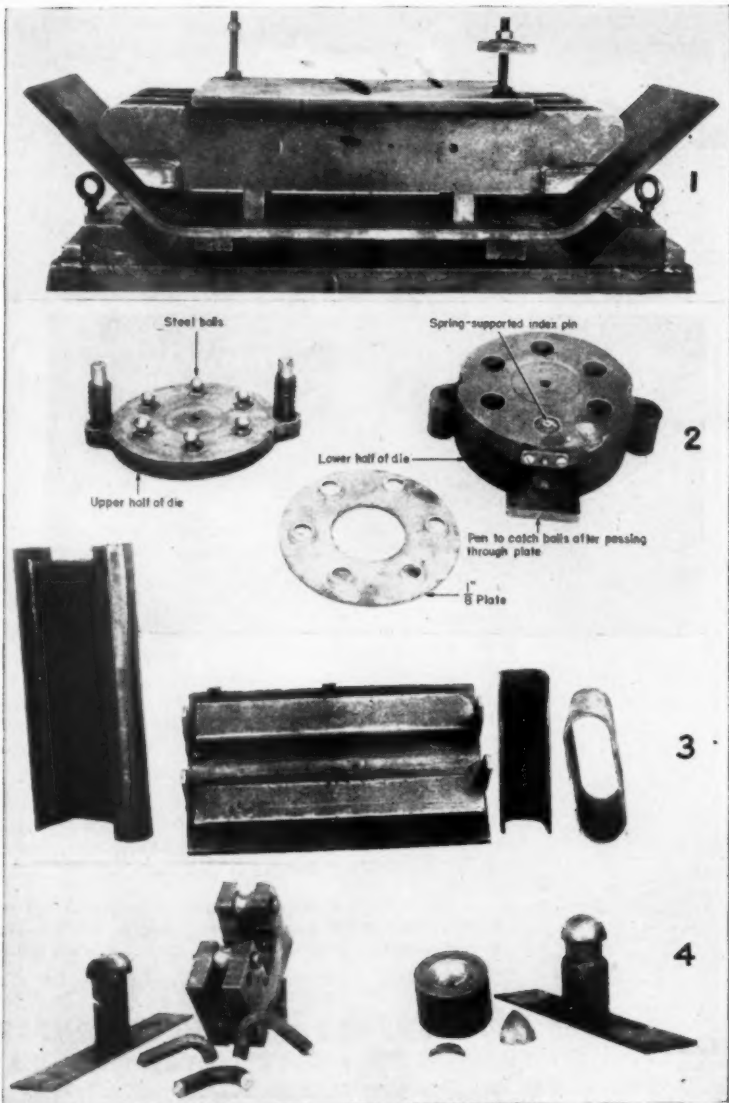
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Broaches



Broaching Machines - Broaching Equipment





GREATER ACCURACY—MORE PRODUCTION ON PARTS LIKE THESE with the SUNNEN PRECISION HONING MACHINE



Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" finish.



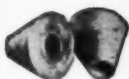
Roller Bearing Outer Race. Finish improved from 12 micro inches to 2 micro inches.



Inner Bearing Ring "Accurately removes last 'teeth' of stock."



Saved time in producing a smooth accurate finish on this bronze remote control valve body.



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."



Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.



Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.



Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .0005 inch."



Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro inch finish.



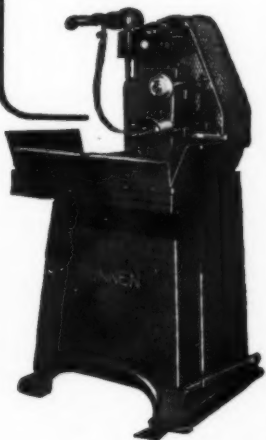
Bronze Valve. The Sunnen method of honing is used to secure a high end accuracy.



Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping—and gave a straighter hole.



Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.



The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.



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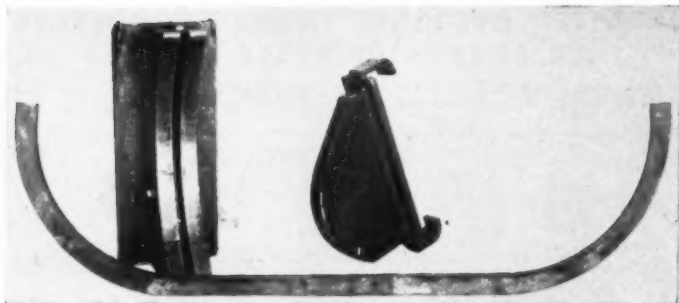
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corners of the dies are worn they can be built up with a little welding and ground to contour by hand.


Another type of job is shown in Fig. 2. Steel disks with six eyeleted holes were required for a particular job, and the dies shown in the upper corners were designed to do the job. The disks are cut from steel plates $\frac{1}{8}$ " thick, and the $\frac{3}{4}$ " holes are drilled. The disk is placed on the lower half of the die (shown at the right) and located by the spring supported index pin. A $\frac{3}{4}$ " steel ball is then placed over each of the holes, and the upper half of the die is set in position. This assembly is then placed in a hydraulic press and the balls are forced thru the holes, producing the extruded eyelets as shown in the center. The steel balls drop into the hollow lower die then to a pan from which they are easily removed. If regular tool drawings had been made, their cost would have exceeded the actual cost of the die equipment.

Consisting of two parts, each of which is

flame-cut, ground by hand, and welded, the dies shown in Fig. 3 form generator air tubes. Using the device in a hydraulic press, the air tube halves are formed from $\frac{1}{4}$ " steel plates and then welded together forming the tubes shown at the right. No machine work was necessary to develop this device.

Shown at the left in Fig. 4 is an adjustable die for forming different sizes of lifting lugs from $1\frac{1}{4}$ " bar steel. The die shown at the right is used to form odd shaped pieces for corner sections in welding round-cornered boxes. These two low-cost dies were designed and built without aid of the usual tool drawings and have been used for several years.

The welded steel plate die shown in Fig. 5 is used in a hydraulic press to form casing-joint flanges such as the strip shown in the lower portion of the illustration. The only machine work required was drilling of a few holes in the lower part of the device.



DIAMOND TOOLS

Diamonds vary in quality and it is important to use the proper kind for a given job.
"Bargain diamonds" are not an economy.

If you don't know diamonds know your diamond dealer.
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Atlas

10" LATHES

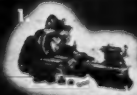
" . . . these machines are indispensable "

"While not as fast as automatics, these machines are indispensable on lots up to 1,000 pieces, and in some cases, we have run as many as 7,000 economically." This report of the Resistoflex Corporation, Belleville, N. J., is typical. Equipped with tailstock turret and other production attachments, Atlas lathes have such unexpected records on all types of screw machine work that many firms are counting heavily on compact Atlas tools in their reconversion plans.

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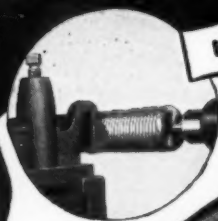
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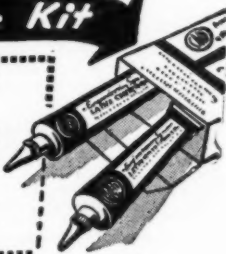
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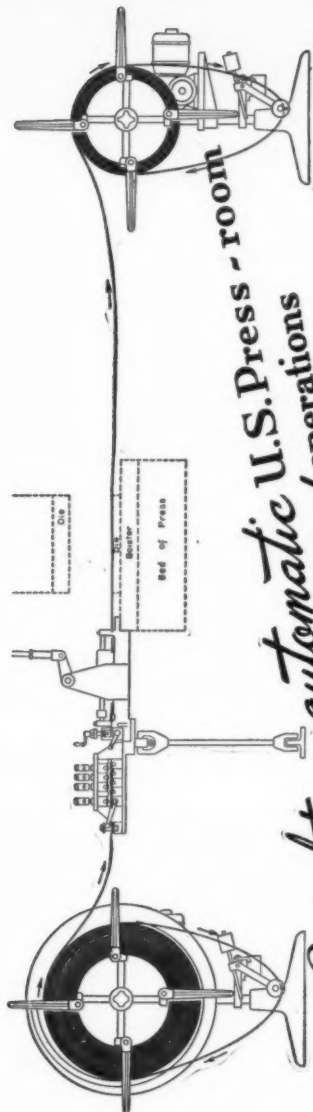
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Equipment for improved operations
U.S. Press - room

The above drawing illustrates the ideal setup for metal stamping. It consists of the U. S. Automatic Stock Reels applied in conjunction with U. S. Slide Feed, Roller Check and Stock Straightener. This combination assures high speed, top efficiency and the greatest possible economy. The unit at the left of the drawing illustrates the patented design for the latest U. S. Stock Reel, which features a spiral grooved disc for easy and accurately centralizing the stock.

The unit to the right in the drawing is a combination of the No. SF-2 Slide Feed, Roller Check and Stock Straightener, the perfect setup for accurately feeding coil stock into punch press dies without the need of pilots. Slide Feeds are available in a range of sizes to accommodate various widths of stock and feed lengths. The feed accuracy obtained surpasses by far the accuracy of roll feeds, hitch feeds or hand feeding. The Roller Check

(mounted between the Feed and Straightener) consists of a pair of rolls controlled by a one-way clutch, permitting free forward rotation only and positively preventing backward slippage, regardless of tension. The Stock Straightener is fully dependable, with the advantage of anti-friction bearings, crank-operated entering rolls (to start a new coil without disturbing the setting), provision for adjusting each individual roll for the desired straightening action, and a control of the entering rolls.

Indicated at the extreme right is another U. S. Automatic Stock Reel for rewinding scrap; this is essentially the same as the Reel at the left, except that the Centralizing feature is omitted.

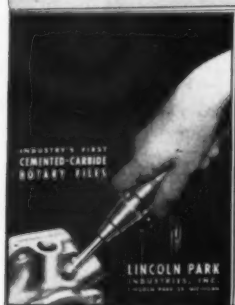
Detailed features of each of these U. S. units are fully illustrated and described in Bulletin No. 50—with complete specifications for these units (also Coil Cradles and Stock Oilers). Write for your copy.

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Carburs are now available in twelve standard shapes, each in from four to six different sizes and from fine to coarse cut—to meet almost any need. This new booklet contains illustrations and prices of all the standard tools now being produced. Write for your copy today.



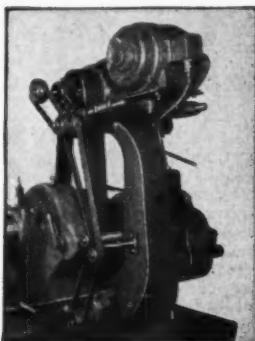
Carburs have been put to almost every conceivable test, and from the results of these tests conducted in actual production it has been proved that Carburs offer at least fifty times the tool life of high speed rotary files. They provide a sharp cutting edge over a long period of time . . . reduce burring, filing or cutting time per part materially . . . and generally increase efficiency in these operations in all types of production.



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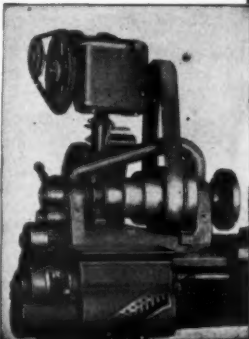
Berkeley drives are sturdily built. Easily installed, they become integral parts of the machines and give long term dependable service with freedom from maintenance worries. Machines are independent of line shafts and can be installed in the most advantageous positions.

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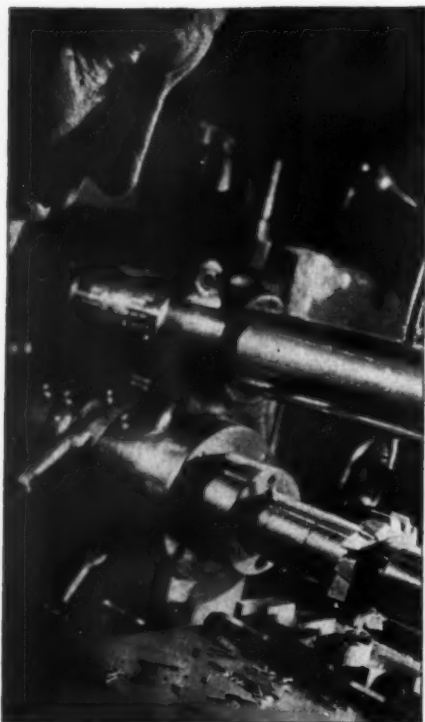
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LOWER COST per piece milled

WHETHER YOURS is a large or small plant you'll be interested in the low-cost-per-unit-of-production features of the Nichols Miller. Consider these records:

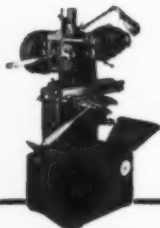
A broaching machine, originally used to cut a wrench slot in a bearing, turned out 3,000 pieces every twenty-four hours. Placed on the Nichols Miller with a specially designed fixture, production was immediately increased to 9,000.

A turret lathe produced 100 units per day of a part requiring a hole-diameter tolerance of $\pm .0005$ "; the Nichols Miller upped this to 300!

On production lines everywhere, this versatile machine performs dozens of high-speed machining operations under the same roof — often doing the work of precision boring machines, lathes and grinders...to tolerances in "tenths."

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WORKING SURFACE: $6\frac{3}{4}$ " x 21", or $6\frac{3}{4}$ " x 30". RANGE: Longitudinal, 10" or 19"; Transverse, 7"; Vertical-Knee, 13"; Spindle Rise and Fall, $4\frac{1}{2}$ ". STANDARD SPEEDS: to 2400 RPM. SPECIAL SPEEDS: to 5000 RPM.

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Dealers in all principal cities

Let's Talk Shop

SELECTING MACHINE SHOP HELP—PART II

By David T. Armstrong

LAST month your curiosity was stimulated by a series of questions proposed for selecting machinists. In this article, you are provided with the answers. Few machinists register perfect scores but all good machinists should make high scores. Without additional evidence, I would say 10 correct answers might indicate a third class machinist; 15 correct replies a second class machinist; 20 right answers a first class machinist, and 25 right, a toolmaker of rare genius.

This is only theory. Many good machinists cannot answer these questions, but they can do a good day's work. Actual machine shop ability always is better than theory. But a good grounding in theory plus genuine machine shop practice and skill make a machinist who knows what the engineers and designers are trying to do. The presence of such a man in any shop will be a morale builder and a brake on such comments as—"It's a crazy idea the engineers have". Here are the answers:

(1)—The usual order of operations is:—
(1) Facing; (2) Spotting for center; (3)

Centering; (4) Turning or drilling; (5) Threading or boring or reaming; (6) Grinding or threading; (7) Lapping.

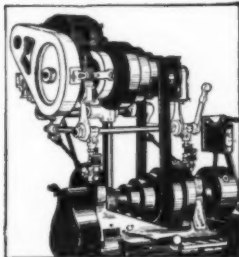
(2)—The included angle of the points of drills has been established at 118° for general work.

(3)—The work piece revolves in a clockwise direction to cut an internal left handed thread when the tool bit is facing away from the operator. Incidentally with such a set-up it is possible to set the compound rest at 30° and feed into the work the same as in external threading on a shaft.

(4)—When the Rex AAA tool steel is in the unhardened state, it is possible to turn it with a hardened Rex AA tool bit. In the hardened state it would have to be ground, or turned with a carbide bit.

(5)—The Pitch Diameter of $7/15"-14$ thread would be .4375 minus .0464 or .3911". The P. D. is the most important measure of threaded plug or ring gages.

(6)—When the measurement over the wires is .2577 the thread will be correct. The formula $P. D. = \text{Measurement} -$



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You'll find changing speeds a noisy operation with many drives. That is the big difference between Remco and the others. A Remco is quiet. Motor takes hold gradually by slipping the belt—simple friction-clutch action. No clash, no crash, of metal-on-metal. Instead shockless speed changes made without removing tool from cut in most cases. Less down-time, more out-put! Remco Products Corp., State St. of R. R., York, Pa.

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(3W—.8660254) is the same algebraically as

$$\frac{N}{\text{Measurement}} = \text{P. D.} - (3W—.8660254)$$

which becomes .226803—.061857—.03093, or .2577.

(7)—The drill usually specified for tapping $\frac{1}{4}$ -20 thread is No. 7 which is .201. However in many shops not equipped with number drills, the $\frac{13}{64}$ " (.203) is used. This gives approximately 75% full thread.

A fairly close approximation of the size of the drill can be determined by subtracting "one pitch" from the major diameter. For a 1-8 we would use a $\frac{7}{8}$ " drill. For a $\frac{3}{8}$ "-16, subtract $\frac{1}{16}$ " from $\frac{3}{8}$ " which gives $\frac{5}{16}$ " as the tap drill.

(8)—Cut taps are used for ordinary work not requiring precision; commercial ground taps are for general precision work; precision ground threads are made to special limits, for example: Taps having a P. D. between basic and minus 0.0005 limit No. 01; Taps having a P. D. between basic and plus 0.0005, limit No. 1; Taps having a P. D. between .0005 to 0.0010 over basic limit No. 2.

(9)—The three taps usually included in a tap set are taper, plug, and bottoming. The taper tap is used to start a thread, and the bottoming tap, to get to the bottom of a blind hole.

(10)—The compound rest is set at an angle of 60° with the axis of the cross slide, or 30° with the axis of the spindle to cut a 60° center.

(11)—The essential thing to remember in all indexing is that the worm wheel on the spindle has 40 teeth and that the worm is a single thread. This means that for every turn of the crank, the spindle is rotated $\frac{1}{40}$ th of a revolution, or that it takes 40 turns of the crank to turn the spindle one complete revolution.

(12)—The angle at the point of a threading tool bit is 60° for cutting an American National Form thread, both fine and coarse series. The included angle measured in an axial plane between the sides of the thread for the American National Form threads has been established at 60° .

(13)—By using one of your own blueprints you will be able to determine whether or not the prospective employee can interpret drawings properly.



A lathe attachment consisting of a combination tool holder and follow rest. Consolidated in one piece, the MICRO-TURN/THREAD can easily be installed in the tool post of any lathe. Incorporating such features as: Quick retractibility of tool, used at the beginning and end of threading cuts. . . . Cross movement for cut off and forming. . . . Quick change of tools without disturbing set ups.

The MICRO-TURN/THREAD is designed to simplify long, small-diameter shaft work . . . to take short runs of collars, studs, bushings, etc., out of the nuisance class, and into profitable business. The MICRO-TURN/THREAD performs these operations on old antique lathes, which ordinarily would be considered useless. An outstanding development in lathe attachments . . . a demonstration will convince you . . . write today for descriptive folder.

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ALMOND Three Jaw Drill Chucks are widely used for holding drills, taps, reamers and other tools, and are always used in connection with and by being mounted upon some form of machine tool such as drill press, lathe, or milling machine. Also used on portable tools, principally electric and pneumatic drills.

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(14)—The fastest way to turn a piece of work 2" long with the outside diameter concentric with a hole thru the center would be in a four jaw chuck. Drill and ream the hole, turn the outside diameters, and cut off. It could also be done by drilling and reaming the hole, fixing the work piece on a mandrel, and turning the outside diameters between centers. This involves more set-up time and such an answer may indicate lack of experience in comparative methods of machining.

(15)—To cut an accurate American National Form thread, the compound rest is set at 30° with the cross slide axis. In actual practice, the compound rest is set at slightly less than the full 30°.

(16)—Several different types of screw threads in common use are:

(a) American National Form threads. This is the 60° thread with a flat at the root and the crest.

(b) Acme thread. This is a 29° thread with a flat at the root and the crest. It is commonly used on feed and lead screws.

(c) Worm thread. This is a 29° thread with a flat at the root and the crest, but the depth of the thread as well as the width of the flat at top and bottom differ from the Acme thread. It is used principally in worm gearing.

(d) Buttress threads. This is a 45° thread with one side of the thread perpendicular to the axis of the screw. These screw threads were designed to resist heavy axial loads in one direction.

(e) American Standard Pipe threads. This is similar to the 60° American National Form except that it has a taper of 3/4" per foot. It is commonly used where leak-proof thread joints are necessary.

(f) International Metric thread system. This thread is of the same form as the American National Form. The sizes and pitches in this system are in millimeters. This thread is used on spark plugs in America.

Other screw threads not in such common use include: — Square, Sharp V, Whitworth, and many other threads for special purposes.

(17)—Since the material to be drilled is not specified, this answer requires the standard rule that carbon drills will have the same feed per revolution as high speed drills, but rpm and surface speed will be half that for high speed drills.

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It has a circular series of laminated, resilient Cantilevers of 200,000 lb. steel operating in taper-side slots. End thrust is impossible: leverage on the cantilevers decreases automatically with increased load: safety stops prevent damage from extreme overloads: special end-float obtainable up to four inches without increase in cantilever stresses: outer periphery can be used as a brake drum for quick-stopping machinery. Over 3,000,000 H.P. in service. SEND FOR BULLETIN No. 28-B.

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(18)—A tool bit producing a small chip which breaks up and flies in all directions should be reground so that it has proper clearance and rake and a sufficiently deep chip curler to make a long curling chip.

(19)—It is possible to cut a keyway in a lathe by using a boring bar and a tool bit ground to the size of the keyway. The hand wheel on the carriage feed will provide sufficient power for a light cutting stroke. Cutting a keyway on a shaper is a modification of this. This method is still used in small shops not equipped with a broach or a keyway miller to cut an occasional keyway. Care must be exercised to make the keyway straight and square with the face of the work.

(20)—The most common types of indexing used on milling machines are:

(a) Rapid indexing—The worm and wheel are disengaged and the spindle is moved by hand. The required number of divisions on the work are made by means of the rapid index plate located on the nose of the spindle.

(b) Plain indexing—This is a method of indexing for numbers beyond the range of rapid indexing. The worm and wheel are engaged in a 40 to 1 ratio, one turn of the index crank making 1/40 of a revolution of the spindle. Three index plates make it possible to index a great variety of divisions.

(c) Differential indexing—This type of indexing involves use of the worm and worm wheel of the dividing head plus change gears and the three index plates furnished with the headstock. With this arrangement, all numbers from 1 to 382 may be indexed and many others besides.

(21)—One expects a first class machinist to have had sufficient milling machine experience to know the number of holes in each of the circles in the three index plates. To index for 7 divisions it is necessary to make 40 or 5 5 turns for each

$\frac{40}{7}$ $\frac{5}{7}$
division. This could be done in either of these ways by plain indexing:

(a) Five complete turns and 15 holes in the 21 circle on Plate 2, or

(b) Five complete turns and 35 holes in the 49 circle on Plate 3.

(22)—Indexing for degrees is exactly the same as indexing for divisions. Thus 30° would be 1/12 of a revolution of the spindle since the spindle makes 360° in a complete revolution. Consequently, 40/12 would be 3-1/3 turns for each division. This could be indexed:

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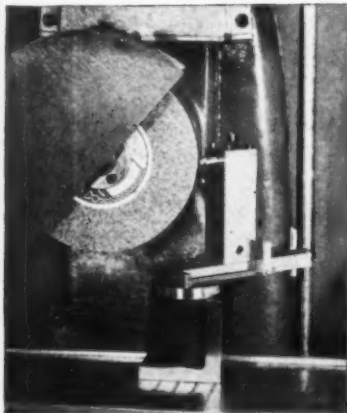
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(a) Three complete turns and 5 holes in the 15 circle.

(b) Three complete turns and 6 holes in the 18 circle, etc. Incidentally, one turn of the crank is 9°, one hole in the 18 circle would be 1/2°.

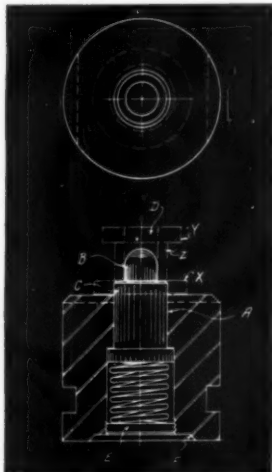
(23)—A standard milling machine rule is that whatever cutter is used should be of as small diameter as possible for the sake of economy in cost and to avoid unnecessary "run in" allowances. The length of the cut is determined by the diameter of the milling cutter, the smaller diameter cutter making a smaller length of cut and hence less machine travel and less time consumption.

(24)—With high speed steel cutters, brass is usually cut at 150 to 200 feet per minute; cast iron at 100 to 120 fpm; machinery steel 80 to 100 fpm; and annealed tool steel at 60 to 80 fpm.

(25)—The toolmaker's universal vise has the greatest range of utility. This vise can be set at any angle and the work inserted or removed without changing the setting.

GEAR ASSEMBLING FIXTURE

(By Alex S. Arnott)



To assemble two gears shown in the drawing, a special assembly fixture was necessary to assure a correct line-up of the gear "X" on the shoulder "Z" of the



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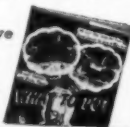
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gear "Y". The problem of assembly was increased by the fact that the shoulder on the gear "Y" had to be machined .0005" larger than the bore in the gear "X" in order to assure a positive fit of the two gears.

The feature of this fixture is that it keeps the centers of both gears in absolute line until they are assembled, and prevents the teeth on the gears from being damaged during the operation.

The body is a piece of circular tool steel with two slots milled across the circumference to accommodate clamping it to the press. It is bored to take the diameter of the guide "A". This is made a sliding fit so that the guide can move up and down freely in operation. The guide is a hardened piece and is machined to take the bore "D" of the gear "Y" and also to fit the bore "C" in the gear "X". A heavy spring is inserted into the bore of the body and is backed up with a special screw "E" to keep the spring in place. Adjustment of the tension on the spring may be made by moving the screw in or out of the body.

The fixture is mounted on the table of an arbor press and the gear "X" placed over the diameter "C", after which the gear "Y" is mounted over the diameter "B", the face of the gear resting on the side of gear "X". The ram of the press is then brought down to make contact with the face of the gear "Y" and when pressure is put on this gear, the spring is slowly backed away allowing the gear "Y" to enter the bore in the gear "X" until the two gears are completely assembled.

The relief "F" in the body is to assure a locating surface for the fixture on the press table.

SPECIAL FILING MACHINE

In the manufacture of small instrument-type motors, slots in the stator cores are filed to remove burrs and irregularities on the sides in order to facilitate winding. The file must be safe on the bottom edge to prevent scoring of the bottom of the slots, which would be detrimental to the magnetic properties of the core. Joseph Geenens, an assistant general foreman at a General Electric plant, has developed a special filing machine to do this work, which by eliminating hand filing methods, has resulted in considerable saving in time and money.

A tail stock assembly from a winding machine, a small motor with speed reducer, a holding fixture, and a file make up the unit. The motor drives the advancing crank wheel of the center shaft

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SPECIFICATIONS

MODEL: SP 4400-20-1/4.

CAPACITY: Water soluble, 1200 G.P.H.

Light oil, . . . 1000 G.P.H.

Heavy oil, . . . 600 G.P.H.

(46 SAE Max.)

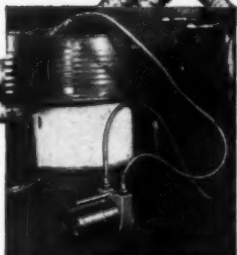
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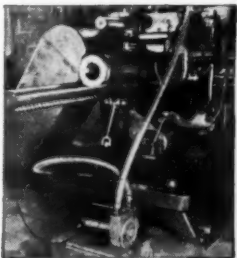
nozzle assembly. (Pump will handle four nozzles. Price \$3.25 each nozzle.)

MOTOR: 1/4 H.P. NEMA, 110 v. A.C. 50/60 cycle. Capacitor type, with cord, switch and plug.

Pump will deliver from a drop per minute to full capacity by regulating discharge nozzles. Not recommended for permanent service on grinders or honers.



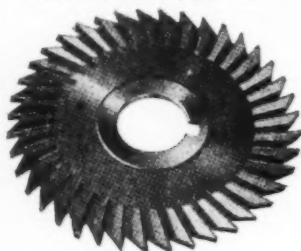
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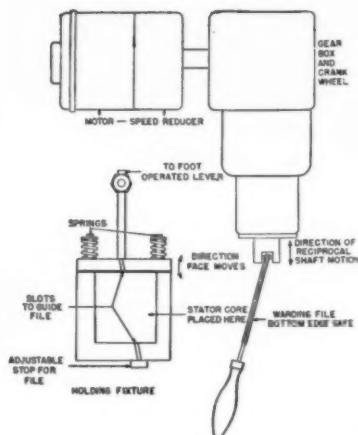
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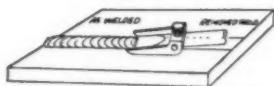
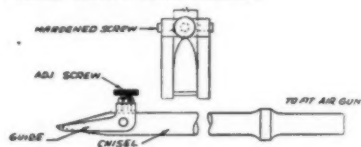
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2	1/2	1/2	\$4.20	4	3/4	1	\$13.30
2 1/2	3/4	3/4	4.20	4 1/2	1	1 1/4	13.30
3	1	1	4.40	4 3/4	1 1/4	1 1/2	14.30
3 1/2	1 1/4	1 1/4	4.40	5	1 1/2	1 3/4	14.30
4	1 1/2	1 1/2	4.80	5 1/2	1 3/4	2	15.10
4 1/2	1 3/4	1 3/4	4.80	6	2	2 1/4	15.10
5	2	2	5.40	6 1/2	2 1/4	2 1/2	16.70
5 1/2	2 1/4	2 1/4	5.70	7	2 1/2	3	16.70
6	2 1/2	2 1/2	6.00	7 1/2	3	3 1/4	18.20
6 1/2	2 3/4	2 3/4	6.60	8	3 1/4	4	18.20
7	3	3	6.50	8 1/2	4	4 1/4	21.30
7 1/2	3 1/4	3 1/4	6.90	9	4 1/4	5	19.70
8	3 1/2	3 1/2	7.20	9 1/2	5	5 1/4	19.70
8 1/2	3 3/4	3 3/4	7.60	10	5 1/4	6	21.80
9	4	4	8.00	10 1/2	6	6 1/4	24.00
9 1/2	4 1/4	4 1/4	8.00	11	6 1/4	7	24.00
10	4 1/2	4 1/2	10.10	11 1/2	7	7 1/4	28.40
10 1/2	4 3/4	4 3/4	11.30	12	7 1/4	8	34.40
11	5	5	11.30	12 1/2	8	8 1/4	40.30
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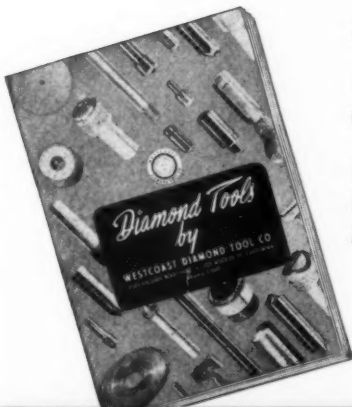
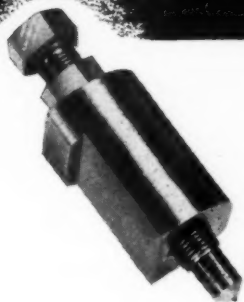
of the tail stock in reciprocal motion. The file is attached to the center shaft and guided by a slot in the holding fixture. The core is held by spring pressure in the holding fixture and the file may be held in the core slot either by hand or spring pressure. A stop is provided on the fixture, indicating that the slot filing is complete and to aid in preventing interference with the bottom of the slot. A warding file of proper size is used to give the correct slot width.

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(Drawing, Courtesy The Hobart Brothers Co., Troy, Ohio.)

ADJUSTABLE FACING CUTTERS

A new adjustable facing cutter, used in boring bars on horizontal boring mills, has been devised by Patrick L. Richards, a boring mill operator at General Electric's Pittsfield Works. The cutter consists of two blades inserted in diagonal grooves machined in either end of a holder and made adjustable by means of set screws threaded thru the holder into the grooves. The blades are locked in position by pressure which is applied from off-center circular clamps built in the holder.



Using either the conventional or new type cutters—two or more in the same boring bar—it is often necessary to maintain a definite dimension between cutters. This was difficult in the old type because when one cutter became dull it was necessary to sharpen all cutters or the dimension would be incorrect. Use of

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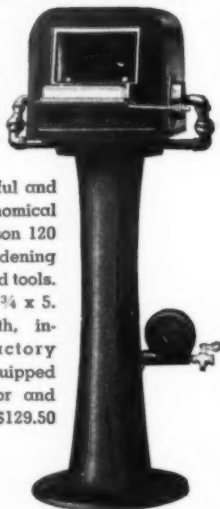
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in 30 minutes.

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the new adjustable cutters eliminates this sharpening. When a blade becomes dull it can be removed from the holder, sharpened, reset in the groove, and a slight adjustment with the set screw brings it back to its previous correct dimension in relation to the other cutting blades on the boring bar.

The life of the conventional type cutters was very limited due to constant sharpening. When the cutting surface was completely ground away the tool had to be discarded. Using the adjustable type, the cutting blades also become worn from sharpening but only the blade is discarded and replaced by a new blade which is inserted in the same holder.

Critical tool steel has been conserved by use of the new facing cutters, and tool maintenance cost has been considerably reduced.

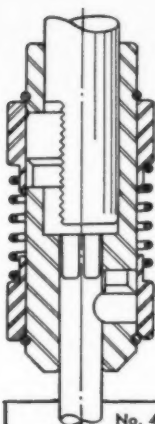
SALVAGING DIE CASTINGS

Zinc base die castings, which are normally difficult to repair, can now be reclaimed with an improved gas welding rod 195 offered by the Eutectic Welding Alloys Co., 40 Worth St., New York, N. Y.



Rod 195 has a lower melting point and a still lower bonding temperature than the original alloy, which make it easier to apply without danger of damaging the parent metal. The improved rod is also easier to build up with, has greater tensile strength, and matches the hardness of the die castings.

An excellent example of what can be accomplished is shown in the accompanying picture of a zinc base fuel pump die casting which had the whole top section

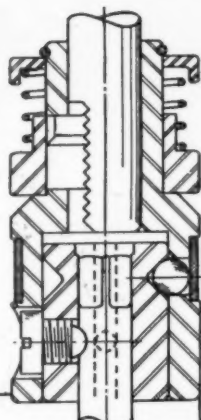


No. 4100
VERTICALLY ADJUSTABLE
FLOATING TAP COLLET
TWO (For No. 6 to $\frac{3}{8}$ " taps
SIZES (For No. 10 to $\frac{1}{2}$ " taps)

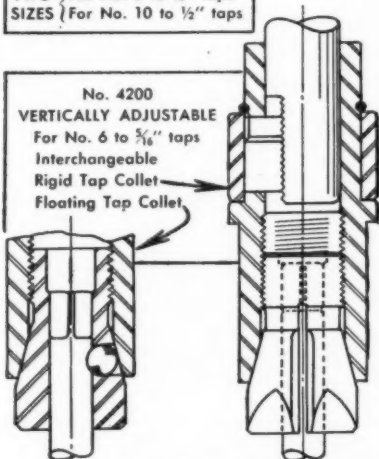
Ettco-Emrick **COLLET TYPE** **TAP CHUCKS**

Can be used on all standard machine tools, and on screw machines, turret lathes and other automatic machinery. Particularly adapted to multiple tapping on close centers. The special shanks can be supplied with any standard Morse taper. Recommendations on right type to use for specific applications, always available.

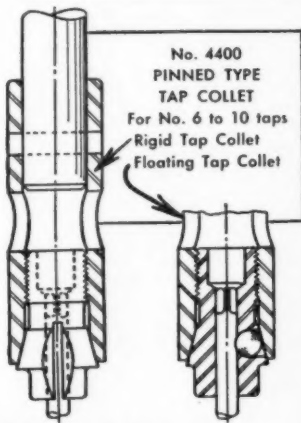
*Drawings are
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PITCH COMPENSATING TYPE
(Special)
For No. 6 to $\frac{3}{8}$ " taps



No. 4200
VERTICALLY ADJUSTABLE
For No. 6 to $\frac{5}{16}$ " taps
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No. 4400
PINNED TYPE
TAP COLLET
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Rigid Tap Collet
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broken off. Previous attempts to build up the part with ordinary rods had been futile, for at the point at which the alloy had to be applied, there was a hole approximately $\frac{3}{8}$ " to $\frac{1}{2}$ " in diameter. This hole had to be bridged without help of a backup material inside the assembly.

The break was "V'd" out to about a 90° angle and the section to be welded was cleaned thoroly. The entire casting was preheated with an acetylene excess flame to about 700° F. at which temperature EutecRod 195 bonds to zinc. Autochemic Eutector Flux 195 was sprinkled over the metal, and as soon as this melted, rod was placed in front of the torch.

The lug was built up to its normal height in less than five minutes, and only one inch of a $\frac{1}{4}$ " thick rod was used.

KENNAMETAL CATALOG NO. 44

An attractive new 48page catalog No. 44 has been issued by Kennametal Inc., 135 Latrobe Avenue, Latrobe, Pa.

A graphic index on the inside front cover provides a quick means of locating any desired type of tool or product. Kennametal tools, illustrations of their primary applications, along with specifications and prices are well covered. Lathe centers and the new lathe files are included, along with blanks. Detailed instructions are given on how to specify and order special tools, and several pages are devoted to the proper use of cutting tools. Tool wear is analyzed, and comprehensive instructions are given for the grinding of the different types of tools. Complete instructions are included for the brazing of cutting tips, and the story of the development of milling cutters is included with data on various types. Several pages are devoted to Kennametal specialties.

In short, a great amount of useful data is attractively presented for users of carbide cutting tools.

PIVOT TYPE BALL BEARINGS

Pivot type ball bearings are now available from Miniature Precision Bearings in sizes ranging from 2-10mm O.D. and made of beryllium, stainless or chrome steel as required for the application. Bearing races are machined from solid bar stock and highly finished on raceway and exterior surfaces. Each bearing is equipped with four balls of the same material as the cup and fitted with a retaining cap.

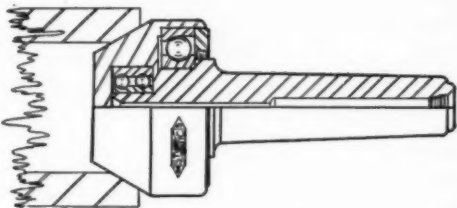
Delivery is prompt and prices have recently been lowered. Full specifications on request from Miniature Precision Bearings, Keene, N. H.



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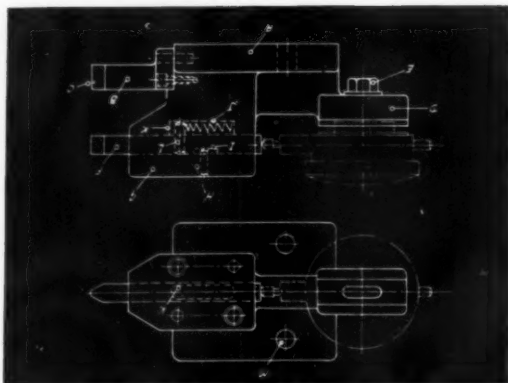
CONTOUR FOLLOWER GAUGE

A gage to inspect parts which have an irregular outline is shown. Its purpose is to determine the accuracy of any form of contour regardless of its irregularity of outline.

The base (A) is a well seasoned casting which supports all members of the gage. Attached to the base with screws and dowels is the follower (B) which is made from good quality tool steel, hardened and ground to take the wear on the point (C).

The dial indicator is shown in dotted chain lines and this outline shows its position in relation to other parts of the tool. It is fastened to the bracket (D) with the nut (E) and is adjustable in any direction, the point making contact with the guide (F).

The guide (F) is a slip fit in part (G) which is fastened to base (A), and is re-



stricted in its movement by stop pin (H) and undercut groove (I). The tip is hardened and ground. The rest of the guide may be left soft, but should be made of tool steel with a ground finish. To keep follower (B) in the forward position,

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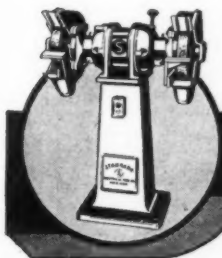
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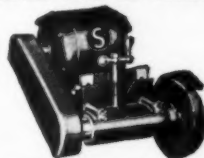
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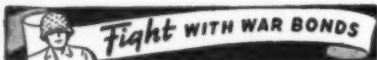
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spring (J) is inserted in undercut groove (K) and has tension on pin (L) which is a press fit into guide (F) and serves to take tension from the spring and transmit it to guide (F).

To use this type of gage, it is necessary to have a template made from steel and slightly hardened. This template is made to the exact contour of the part to be inspected and is fastened to a surface plate or fixture. When inspecting parts with gage, one of the parts is placed on top of the steel template and the gage is brought up to the work. In some cases, when parts are light in weight, the gage is fastened to the bench surface thru the holes (M) and parts are moved to the gage. In any case, the follower (C) makes contact with the steel template and the guide (F) touches outline of the part itself. With both the guide and the follower in this position at all times during the inspection, the gage is moved by hand all along the contour. If contour of the part being inspected is inaccurate, the guide (F) will move in and out of the gage, depending on how inaccurate the contour of the part is. The movement of (F) moves the pointer of the dial in and out revealing the inaccuracy on the dial. It should be observed that the follower must be in contact with the steel template thruout the entire operation.

By Alex S. Arnott

LINCOLN A-C ELECTRODE

A new general-purpose electrode for mild steel, designated as "Fleetweld 35", and made specifically for operation on a-c is announced by The Lincoln Electric Co., Cleveland, Ohio.

This new shielded arc electrode, which will also operate on d-c with either polarity, depending upon the type of work being done, has all the desirable characteristics of the popular Lincoln "Fleetweld" electrodes for high speed welding of single or multiple passes for work in flat, vertical or overhead positions.

Available in 1/8, 5/32 and 3/16" sizes, "Fleetweld 35" has exceptionally high physical properties, the as-welded weld metal specimens testing:—Tensile strength, 62,000 to 70,000 psi; Yield Strength, 52,000 to 57,000 psi. Ductility (Elongation in 2") 23 to 30%.

"Fleetweld 35" conforms to American Welding Society specifications for arc welding electrodes classes E-6010 and E-6011, is made in the standard 14" lengths and is packed in 50-pound containers.

BOYAR-SCHULTZ NEW 618 SURFACE GRINDER

TOOL ROOM PRECISION

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DESIGNED to meet the demands for precision in the most exacting tool and die work and gage grinding, this new Surface Grinder is engineered to maintain that high degree of accuracy through long, continuous work.

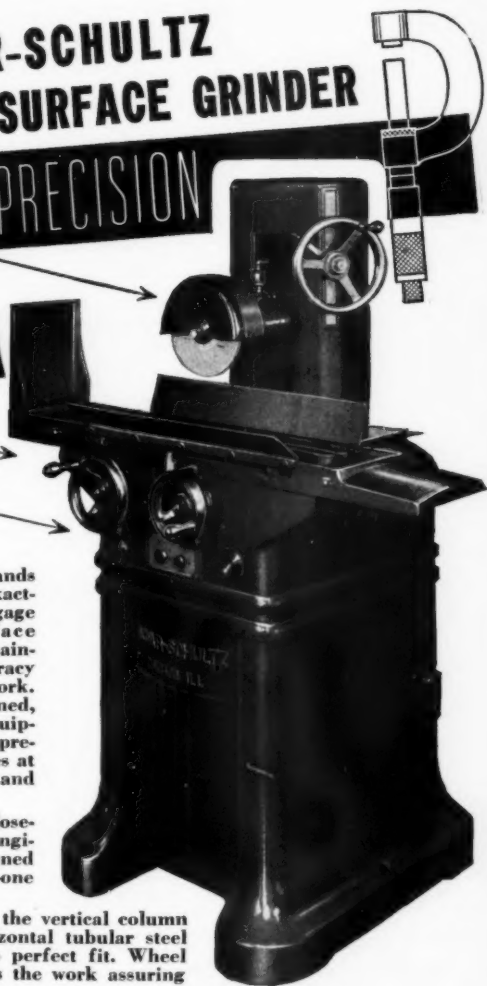
Spindle is specially designed, dynamically balanced and equipped with super-precision, pre-loaded ball bearings; operates at 3,000 R.P.M., smoothly and quietly.

Table of seasoned, close-grained Meehanite moves longitudinally only, and on hardened and ground tool steel ways—one V and one flat.

Cross feed is provided by the vertical column assembly supported on horizontal tubular steel ways, ground and lapped to perfect fit. Wheel moves in a true plane across the work assuring long continuous accuracy.

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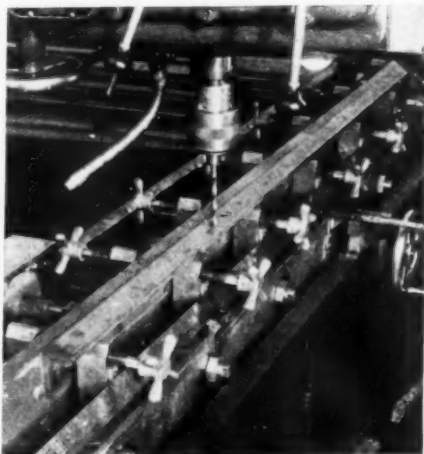


DRILLING HOLES IN STRUCTURAL ANGLES

A new drill fixture, used for drilling holes in structural angles up to 10 feet in length, was devised by R. K. Best at General Electric's Pittsfield Works. The fixture consists of a T-bar holding assembly, equipped with scales and indicators for quick, easy, and accurate indexing in both directions.

It rides on rollers located in a channel, the side of which acts as a guide, and the fixture may be moved easily in a lengthwise direction by the operator. It is operated in a crosswise direction by means of a pair of worms operated by a handwheel conveniently located on the front of the base.

The piece to be drilled is held in place by hand-operated clamps. These clamps are provided on both sides of the T-bar, thus allowing both sides of the angles to be drilled without turning end for end. The hand clamps could be easily converted to air clamps, thereby reducing



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When you look at the husky "Buffalo" motor spindle drill you're looking at a machine which handles a lot of work! And users like it! In one plant of a large manufacturer of aviation engines, one hundred of these drills have been on twenty-four hour duty for nearly two years.

This manufacturer is now setting up a new production line for building a larger engine in addition to the present model. One hundred more "Buffalo" Motor Spindle Drills are on order to take care of this additional work.

Buffalo Motor Spindle Drills are made in two sizes, rated for 1" and 1½" capacity in cast iron. They can be furnished with or without back gearing, power feed, and motor reverse for tapping. All details of construction are, of course, for heavy-duty service. And, both sizes are available in from one to six spindles.



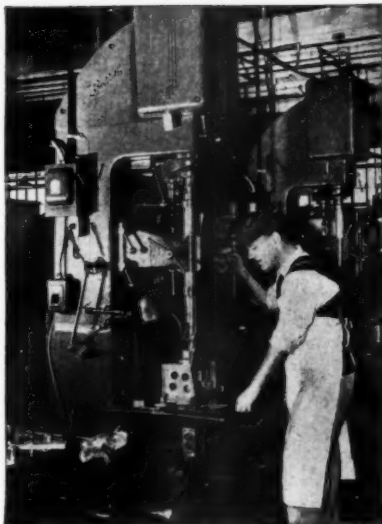
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"Buffalo"

Motor-Spindle DRILLS

the time of clamping the piece to the T-bar. Air clamps are provided to lock the entire assembly in position when properly set up for drilling.

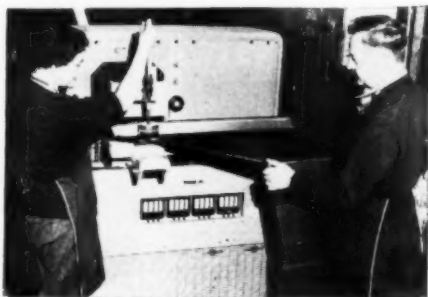
Both longitudinal and lateral scales are

directly in front of the operator in an easy-to-read position. A chart, furnished with each set of angles to be drilled, corresponds to the scales and shows the center positions of the holes.

INDUCTION SILVER BRAZING

On metal life rafts, built by Weber Showcase Co., Los Angeles, Cal., there are 48 manganese bronze drain flanges joined to the 1020 steel sections from which the raft is made.

Bronze welding these flanges in place proved a slow method, taking seven to 12 minutes per flange. In working out a production set-up for doing this job, the company, after thoro experiment and tests, developed a method of application using the low temperature silver brazing alloy Easy-Flo (available from Handy & Harman, 82 Fulton St., New York (7) N. Y.) and induction heating, which together reduced joining time to 51 seconds per flange. What had been a serious bottleneck in constructing the rafts became the fastest part of the assembly. After proper cleaning and fluxing, a washer of Easy-



Flo .003" thick is preplaced between the flange and a raft section. An operator and a helper complete strong, leak-tight joints in less than a minute.

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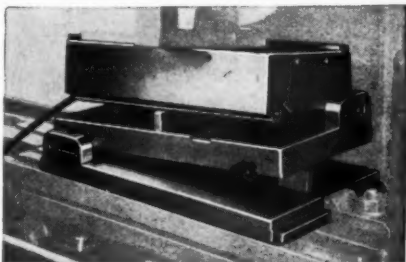
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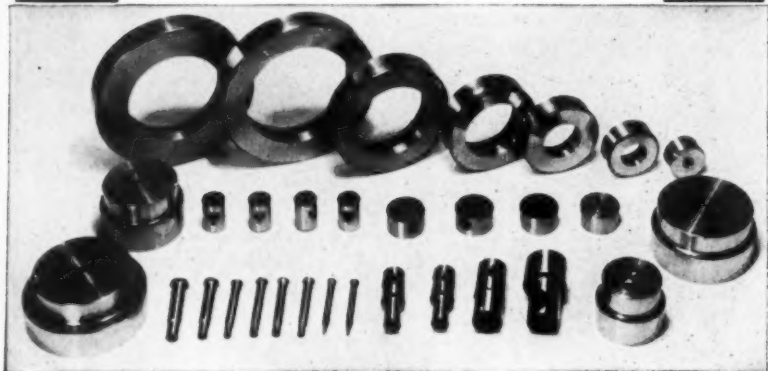
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are being used extensively in the aircraft, electronic, ship building, electrical and sheet metal industries for the production of aircraft and parts, radio and electronic components and chassis, instrument panels, electrical boxes, housings, enclosures, bus bars, sheet metal parts and similar pierced sheet metal up to 3/16" in thickness. For heavier materials send details.

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3. Punches up to 11/32" diameter have small shanks fitting into inexpensive insert sleeves.

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4. On large quantity orders of any one size, partial shipment is made from stock—balance of order is shipped in one week to 10 days.

WIEDEMANN MACHINE CO. 1831 SEDGLEY AVENUE
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The same qualities of accuracy and stamina which have made the 3B an important factor in war production adapt it equally well for production in the competitive post-war world. Precision-built for precision production, the 3-B Automatic Surface Grinder provides ideal facilities for better, faster work. The bed is a one-piece casting, very

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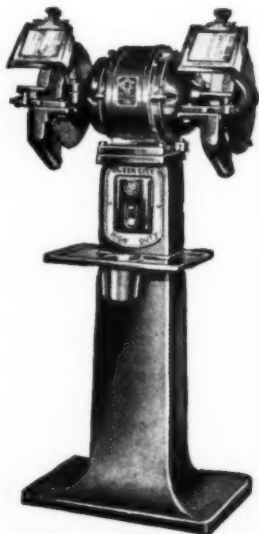


(Illustrated) Model 3-F, 1 H.P. Queen City Heavy Duty Grinder. A low-cost, ball-bearing grinder of unusual productive capacity and durability... built to handle the heaviest loads. Completely equipped, ready for instant use.

A grinder is no place for social gatherings. Several workers "ganging up" around one grinder means vital man and machine hours lost . . . upset production schedules . . . extra costs of operation . . . lower plant morale.

To get greater output per worker, install a battery of several Low-Cost Queen City Grinders. They'll quickly pay for themselves by giving you many more hundreds of actual WORK-HOURS! Queen City Grinders placed in spots handy to workers reduce plant traffic, cut down idle man and machine time . . . meet every grinding requirement, whether it's large or small lots. Agents in principal cities. Write for new catalog.

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WHAT'S NEW IN METALWORKING

MATTISON PRECISION VERTICAL-SPINDLE WAY GRINDER

MATTISON Machine Works, Rockford, Ill., has developed a new type Grinder for finishing tables, slides, saddles, heads, turrets and other parts, having angular machined ways or surfaces. These parts can be ground to closest accuracy and fine finish. Thru the use of this machine, manufacturers are able to eliminate the costly hand scraping operation, as well as being able to finish parts having hardened ways. It also can be used for grinding flat parts, where it is not necessary to remove an excess amount of stock.

The illustration shows the unit grinding the angular surface of a column dovetail way. The sketches will give an idea as to the range of work that can be handled on this type of Grinder.

Mattison Surface Grinders are well known for their sturdy double-column

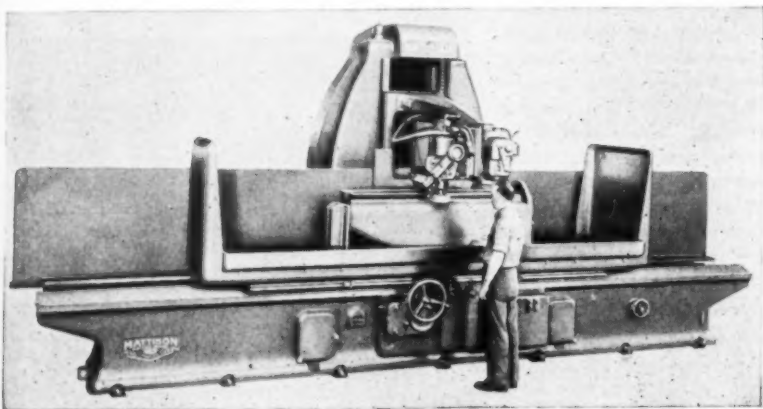
construction; and as you will notice from the illustration, this is also true of the Way Grinder.

The grinding head unit is mounted on a dovetail casting slide, which is part of the vertical slide assembly. This slide is adjustable horizontally by hand, or rapid traverse by electric motor drive. The head unit can be swiveled 60°. A graduated circle permits rough setting of grinding unit to the desired angle. Final adjustment is made by means of sine bar or checking gauge.

A power-driven truing device is furnished for dressing wheel to desired angle.

These Grinders are built in various sizes from table widths 12" wide and 48" long to 36" wide and 192" long.

An attractive new bulletin, available on request gives further information, concerning this machine and its applications.





**By the Army, the Marines,
and the Navy, too.**

SHELDON Precision Lathes have been selected by the Army for its Mobile Machine-Shop Units, by the Marine Corps for its trailerized shops and by the Navy as the ideal lathes for several types of repair shops aboard ship and ashore.

SHELDON Lathes are also widely used in British, Canadian, South African, Russian and other allied factories to speed the production and maintenance of war material . . . proof of worldwide SHELDON accuracy and dependability.



SHELDON 10"
(1-inch collet capacity) Precision Lathe and Bench Unit with E-type underneath motor drive.

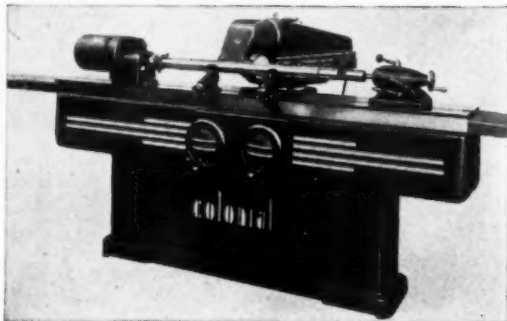
SHELDON
SHELDON MACHINE CO., INC.
4242 N. Knox Ave., Chicago 21, U.S.A.

COLONIAL ANNOUNCES NEW BROACH SHARPENER

A new broach sharpener which takes into account the larger scale use of women operators in sharpening of tools and also provides for the increased sizes of broaches currently being used in industry has been announced by Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich.

The new sharpener (Model CS2) is designed to handle virtually any broach in use today. It will sharpen round and flat broaches, spline and serrated types, etc. Sizes which can be sharpened range from the smallest up to broaches 7 ft. long and a maximum diameter of 6" (8" max. width for flat broaches).

Of particular importance in facilitating broach sharpening is the lightweight alloy construction of the sliding head. This weighs, complete, only about 1/3 as much as if constructed of iron or steel. In ad-



dition, the sliding head is supported and guided on by full anti-friction double-row rollers. All anti-friction bearings are completely sealed against entry of grinding dust.

Available at slightly extra cost is a feature which makes possible the maintaining of identical steps per tooth in regrinding broaches. This is obtainable thru

PRODUCTION VISES With Unusual Features!

Easier to Operate

Presto Vises are noted for features which make for easier and speedier operation. For example: Minimum lever movement in loading and unloading. Wide maximum opening and extra long jaw travel away from work. Toggle-action method of applying pressure. Abundant chip clearance space.

Two different models, as illustrated. Three sizes of each model — 3", 5" and 7" jaws.

**Free
CATALOG**

D. A. SMITH & CO.
8087 Livernois, Detroit 4, Mich.



For clamping parts of
varying thickness.

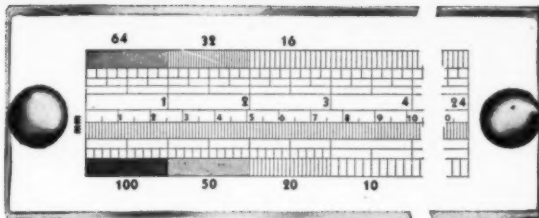


For clamping parts of
uniform thickness.

PRESTO-VISE

"THE RULER OF 101 USES"

Illustrating UNIVERSAL PROJECTOR RULE in one-half actual size. . . All rules are made showing divisions of hundredths, sixty-fourths and millimeters.



... UNIVERSAL PROJECTOR RULE *

This ruler of 101 uses . . . The Universal Glass Projector Rule . . . was bought by four of the first five engineers who saw it.

This Projector Rule makes measurements on Optical Projectors and Comparators quickly possible without resetting measuring comparators and is particularly useful where a number of comparators are on a production line.

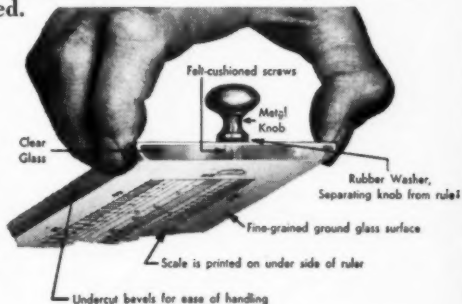
Very accurate measurements are made as all dimensions are ruled on the under side of the ruler . . . one-quarter inch selected plate glass . . . which permits contact of the scale proper and the object being measured.

The Projector Rule is easily read by either reflected or transmitted light and is also perfectly legible under inspection screen visors and hoods, as well as in darkened projector rooms.

Available in 8 sizes, 4" to 24"

Write for Bulletin 1-44ER

*Patent Pending



ENGINEERS SPECIALTIES DIVISION

The UNIVERSAL ENGRAVING & COLORPLATE COMPANY, INC.

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BUFFALO 8, NEW YORK

TWIN  PLANTS

1919 EAST 191st STREET
CLEVELAND 15, OHIO



**3600 Powerful
Blows Per Minute**

SYNTRON

DEPENDABLE

**ELECTRIC
HAMMERS**



With only One
Working Part —
the "PISTON"

save 90% in time and costs, drilling
and chipping in concrete and masonry.

*Impossible to overload.
No gears to strip.*

*Operate from the ordinary
110-60 AC lighting socket.*

Four Powerful Models

"MK"— $\frac{5}{8}$ " Cap.....	\$105.00
No. 16— $1\frac{1}{8}$ " ".....	150.00
No. 22— $1\frac{1}{2}$ " ".....	195.00
No. 25—2" ".....	225.00

SYNTRON CO. 300 Lexington
Homer City, Pa.

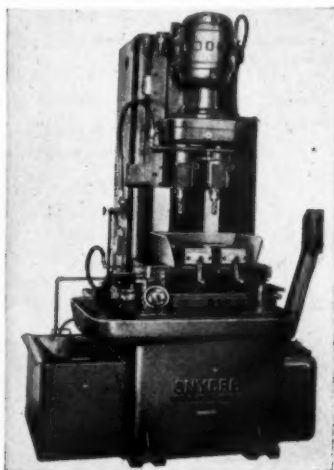
use of Colonial dual-ratio micrometer hand wheels, with which feed can be controlled to the ten-thousandth of an inch.

Another feature available at slight added cost is a special roller curtain design for protecting ways of machine when table is moved. On the standard machine, metal guards are provided for this purpose. The roller curtain design permits a reduction of 6 ft. in total floor space (length) required when sharpening broaches of maximum length of which machine is capable.

Change-over from sharpening round to flat broaches is accomplished quickly and conveniently without special tools and with few adjustments. Universal positioning and movement of grinding wheel are obtained by use of a vertical column, a cross slide mounted on a graduated cross slide support and a graduated wheel head mounting.

Headstocks for cylindrical broach sharpening are provided with reduction gearing giving spindle speeds of 200 and 400 rpm.

MILLING AIRCRAFT PISTONS



A special-purpose milling machine has been developed by Snyder Tool & Engineering Co., 3400 E. Lafayette Ave., Detroit 7, Mich. It is used in milling a rectangular pocket inside the dome of an aircraft piston, and removing stock from

For *ANY* Tension Tightening PROBLEM MOSSBERG'S the Answer:

Besides making a full line of standard wrenches, for torque tightening Apco Mossberg is constantly developing special Torque Tools.

LIGHTWEIGHT TORQUE TOOLS



Recently added to Mossberg's ever-growing regular line of torque wrenches, the lightweight tool meets the need for a wrench to give accurate readings of the low torque required in delicate radio,

ignition and fuel line assembly, in work with plastics and light metals. In four sizes: 0-100 inch ounces, 0-30, 0-50 or 0-100 inch pounds.

HEAVY TORQUE TOOLS



New, made in 4 calibration ranges, Apco Mossberg's wrench to meet high torque tightening needs provides rigid, protected dials with wider, more easily read graduations. Ranges: 0-250, 0-600,

0-1200 and 0-2400 inch pounds. The inch pound unit meets the more rigidly defined Navy specifications and operating accuracy of these wrenches is guaranteed to 98%.

NEW PALM REST TYPE



To meet the need for a wrench to install spark plugs without breaking bushings, Apco Mossberg has developed a palm rest type which keeps the wrench properly balanced while measuring the torque. Better than a T-shaped wrench, which has a "push and pull" motion,

this new Mossberg tool is pulled by only one hand and is balanced by the other. Also used by Pratt & Whitney for original assembly, this wrench has been found to eliminate breakage during overhaul and over-tightening during installation.

For the answer to your tension tightening problems — write to Apco Mossberg

APCO MOSSBERG COMPANY

165 LAMB STREET, ATTLEBORO, MASSACHUSETTS, U. S. A.

TRICO OILERS

Visible, automatic, care-free lubrication for all types of bearing surfaces.



- STOP GUESSWORK
- END BEARING FAILURES
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- MODERNIZE YOUR EQUIPMENT

There's a style for every specific need.

WRITE FOR CATALOG

TRICO FUSE MFG. CO. Milwaukee Wisconsin

YOUR FIRST LINE OF DEFENSE against

HIGH
SHARPENING
COSTS

No. 57T

Automatically
Sharpens
Metal Saws
in gangs

up to 8" in diameter.
Takes gangs up to 3½"
thick. The saws are
automatically indexed
and sharpened within
variation of plus or minus
.001 of exact diameter
of entire lot.

Write for
Folder 57T.



THE WARDWELL MFG. CO.
3165 Fulton Rd. Cleveland 9, Ohio

★ CENTERLESS GRINDING

Straight Cylindrical, Shoulder, Profile,
and Multiple Diameters . . . Long Bar
Grinding . . . Ground Taper Pins and
Dowel Pins.

Screw machine products. Heat treated
and ground if necessary. Improved
and expanded facilities assure prompt
and accurate service.

Send your blue prints or samples for
estimates.

PORTER MACHINE COMPANY
3100 Enyart Ave., Oakley, Cincinnati, O.

inside faces of wrist pin bosses. The machine is an adaptation of a Snyder standard piston milling machine and includes the standard base, column, hydraulic unit and coolant tank assembly.

The milling head has fixed center distance requiring cutters of identical diameter. Each spindle is mounted in a quill providing lengthwise adjustment for tool life.

The machine takes two parts, performing identical operations on both. Piston is located radially by means of a plug entering wrist pin hole and is clamped manually between vise jaws. Pressing cycle start button sends tools into the work until correct cutting depth is reached. The top slide then feeds the work horizontally from left to right, cutting one side of pocket and face of one wrist pin boss. The lower sub-slide then moves fixture rearward until opposite edge of pocket is reached, this movement following a cam which causes ends of this opening to be cut from a straight surface by a radius. Machine then feeds past other side of pocket from right to left and on reaching central position, feeds from left to right again, cleaning up middle section of slot. Cutter head then retracts automatically to stop position, cutters cease running and parts are unloaded.

The standard units on this machine were developed originally for cutting fins and clearances and used a rotary fixture. This is a typical example of how such a machine can be converted—thru use of another fixture and spindle body—to an entirely different operation.

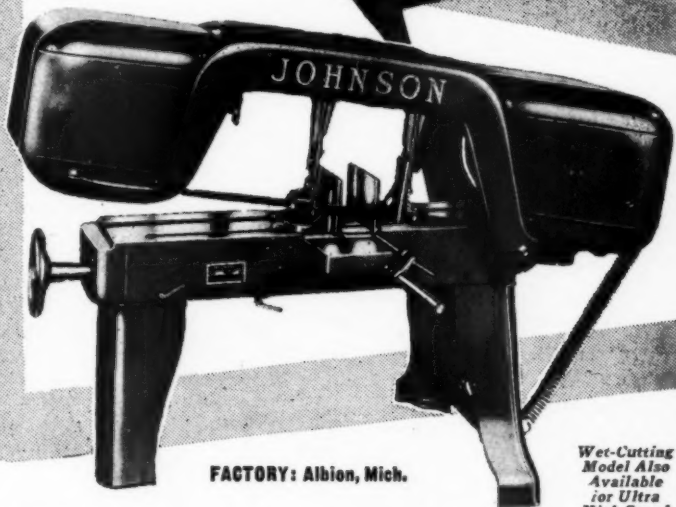
RANSOME POSITIONER BULLETIN

Information on position welding and a description of the complete Ransome line of Welding Positioning equipment is featured in a 40-page, two-color bulletin, No. 2114, released by Ransome Machinery Co., Dunellen, N. J., a subsidiary of Worthington Pump & Machinery Corp.

The Bulletin covers the many advantages of proper positioning for welding and fully explains use of positioning equipment with pictures and text. The complete range of Ransome Positioners from a small hand-operated unit to the 40,000 lb heavy-duty machine are illustrated, as are Turning Rolls and Headstock-Tailstock combinations. Dimensions, load capacities and complete specifications on each model are included. A broad selection of installation photographs showing various models in diversified use are scattered thruout the book. Special applications and special Assembly and Welding Fixtures are included. A copy of the Bulletin will be mailed on request.

**QUICKER!
SAFER!
EASIER!**

**CUT PIPING!
CUT GIRDERS!
CUT SOLIDS!**



FACTORY: Albion, Mich.

*Prompt
Deliveries*

Capacity 10" x 18", Hydraulic Controls
Constant Feed, ½ H.P. Motor

*Wet-Cutting
Model Also
Available
for Ultra
High Speed
Metal
Cutting*

JOHNSON METAL BANDSAW CUT-OFF

Metal sawing is a more efficient operation with the Johnson Saw. Designed for quick set-up; adaptable to practically every kind of cutting job. 3-point base for anchorage on uneven flooring.

Write today for descriptive folder to Sales Office:

**JOHNSON MFG. CORP. 5000 CHRYSLER BLDG.
NEW YORK 17, N. Y.**

VACUUM TEST PIT FOR IMPELLERS

The large vacuum test pit in the Research Laboratory of Buffalo Forge Co., Buffalo, is a good example of what is being done to study stresses and improve quality of high speed rotating machinery.

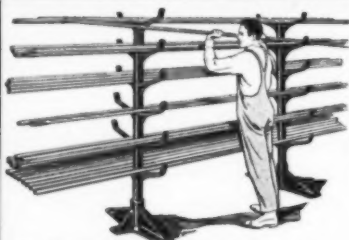
The pit,—so termed because the shell is set in concrete below floor level, is 6 feet in diameter by 4 feet deep. It is made of heavy, reinforced construction to withstand absolute vacuum. While it was designed along lines of the General Electric device for testing turbo-super-charger impellers and capable of operating at 60,000 rpm, it will generally accommodate larger fans at lower speeds.

In operation, impeller to be tested is hung by a slender shaft from a small air turbine mounted on cover. A vacuum pump then exhausts air from the drum so that it takes practically no hp to spin the fan. Pressure within the drum may



reach as low as 200 microns of vacuum (.00787" mercury absolute as compared to standard atmospheric pressure of 29.92" of mercury). Under these conditions, power to drive the fan (exclusive of turbine friction) is about 1/4000 of the power

SAVES TIME IN YOUR STOCK ROOM



The **BROWN SECTIONAL RACK** saves the time wasted end-hauling stock from the old-style, closed-side rack and quickens the selection of sizes by greater visibility. Built of standard metal sections: can be expanded for changes in stock or growth of business. Made in 5 styles: can't burn, depreciation practically nil.

SEND FOR BULLETIN 26-B

BROWN ENGINEERING CO.
126 N. THIRD ST. READING, PA.

ARTUS ARBOR SPACERS

The **COLOR** tells the **THICKNESS**



ARTUS Arbor Spacers made of plastic in various colors identify thickness at a glance! .001, .0015, .002, .003, .005, .0075, .010-.030. Speed up accurate fitting at low cost. Write for folder.

CONVENIENT TRIAL OFFER Handy Spacer Assortment

10 ea. .001 — .0125 thick
5 ea. .015 — .030 thick

100 SPACERS IN ALL

7/8" — \$2.80 1 1/4" — \$3.40
1" — 3.00 1 1/2" — 4.20

Other standard sizes also available.

*Illustrated Folder Free.
Immediate Delivery on
Spacers, Gaskets, Shims*

INDUSTRIAL PRODUCTS SUPPLIERS

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WHEN COLLET WORK IS INDICATED - SPECIFY

Precision Collets

For 10" ATLAS & LOGAN, SOUTH BEND, SHELDON, CRAFTSMAN, POWR-KRAFT, CLAUSING and other important lathes.

IMMEDIATE DELIVERY FROM STOCK

The Precision name on a collet is your unconditional guarantee of accuracy in machining, hardening and grinding. Make sure then to specify Precision when ordering from your dealer. Literature on request.

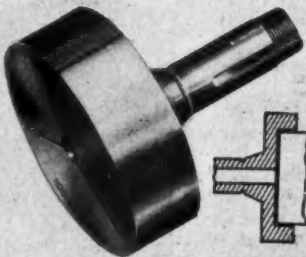
- **MODEL 3AT:** For 10" Atlas, Logan, 12" Craftsman, No. 700 Powr-Kraft.
- **MODEL 3C:** For 8" & 9" South Bend, Clausing, Hardinge No. 3, 10" LeBlond, etc.
- **MODEL 1A:** For 8" & 9" South Bend.
- **MODEL 5C:** For 9", 10", 16", 18" South Bend, 1" capacity Sheldon, Schauer, Sebastian, etc.
- **MODEL 4C:** For 14½" South Bend, ¾" capacity Sheldon, Hardinge No. 4, Elgin, etc.
- **MODEL 480:** For Logan Screw Machine, Turret Lathes and attachments; Warner & Swasey No. 1, etc.
- **BREN Collet:** For Handwheel & Lever-Type Speedichuk.



Adapters for
3AT, 3C, 1A

4C

KLUTCH - KOLLET
(Step Chuck) for chucking work to 2¾" diameter with collet accuracy. Head unhardened for easy boring. Fits 3AT, 3C, 1A adapters only. List unbored \$7.50 each.

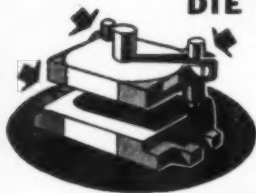


5C

GENERAL DIE-STAMPING-TOOL COMPANY

PRECISION COLLET DIVISION 263-372 Mott St., New York 12, N. Y.

DANLY. PRECISION DIE SETS



Danly
Commercial Sets
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Special Sets

**THEIR
PRECISION**
Means Greater
Accuracy
In Your
Production

DANLY MACHINE SPECIALTIES, INC.

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DANLY PRECISION DIE SETS

MARKS TOOLS, PARTS, etc.

Prevents Mistakes — Avoids Loss

IDEAL

"MACHINE-SHOP"
ETCHER

Permanently writes
letters, numbers on
smooth surfaced
iron, steel, and their
alloys regardless of
hardness of metal.
14 Etching Heats.

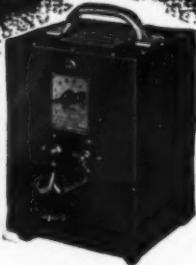
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Literature

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SYCAMORE, ILL.

Sales offices in all principal cities.
In Canada: Irving Smith Ltd., Montreal, Quebec

IDEAL Sycamore

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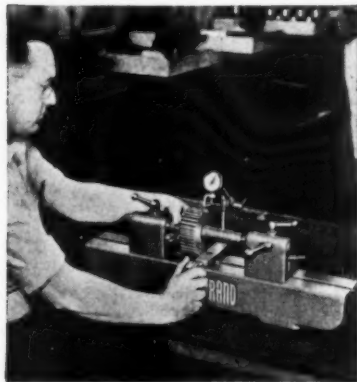


under normal conditions. Acceleration must be gradual, speed being under constant control of operator by means of an air valve and air brake. To keep the speed indicating device from absorbing power at higher speeds, an electronic frequency meter is used. This is a direct reading dial type instrument with suitable amplification.

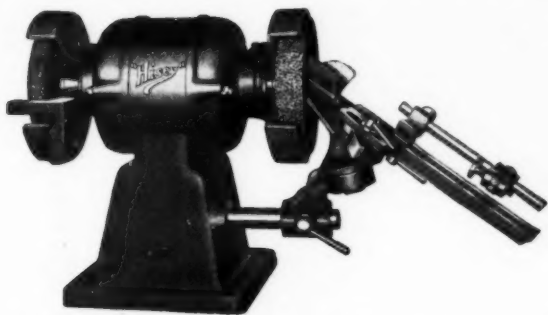
Several purposes are served by a test pit of this type. To insure safety of operation of cast or fabricated constructions, the fan may be run at sufficient overspeed to permit calculation of the factor of safety. On new designs, impellers may be tested to destruction in order to determine the weakest section or some unpredictable condition. For this reason, a laminated shield is provided within the main shell so the force caused by rupture will spend itself against this shield and not seriously harm the shell which maintains the vacuum.

A check on fan balance can be made on high speed impellers that might otherwise be impossible, except at final installation. Thus, a fan that would require 1000 hp to drive normally can be operated in a vacuum of 200 microns of mercury by $\frac{1}{4}$ air hp. Then there is an opportunity to study stress conditions while unit is in operation. A glass aperture in cover of pit permits visibility of the impeller by stroboscopic light. Also thru use of strain gauges in circuit with a cathode ray oscilloscope, stresses and vibration may be visualized and measured.

SUNDSTRAND BENCH CENTERS



Accuracy can be maintained to within limits of .0001" in checking for runout on



Drills MUST be Sharp and - Correctly Ground!

Drills that are sharp and are correctly ground will (1) drill to exact size (2) drill faster (3) drill more holes per grind (4) drill the same with each lip (5) require less power to drill (6) cost less to regrind (7) reduce percentage of breakage.

Hisey Drill Grinders are designed to grind drills correctly and quickly with inexperienced operators.



**MOST HISEY GRINDERS CAN BE
PURCHASED WITH MRO
PREFERENCE RATING**

Hisey Drill Grinders are made in three sizes to grind drills up to 2½ inch diameter. The larger sizes are made for wet and dry operation and will grind straight or taper shank drills with 2, 3, or 4 lips; flat, chucking or flat twisted drills and drills with oversize shanks. The clearance angle and point angle is adjustable on the two larger size machines.

ASK FOR CATALOG 70HH

Hisey THE HISEY-WOLF MACHINE CO.
CINCINNATI, OHIO

a new improved Bench Center developed by the Sundstrand Machine Tool Co., 2535 Eleventh St., Rockford, Ill.

Precision checking of work between centers is simplified and speeded by "one-handed control" over all movable elements, which leaves operator's other hand free to control part being checked. Unclamping, positioning and locking in place of both LH and the RH heads are easily achieved with a single hand operating top lever.

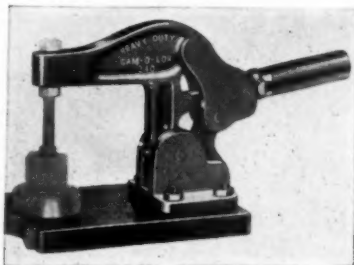
Center in LH head is fixed but that in RH head is spring-loaded and can be retracted by end bar for quick loading and unloading. Front clamp on RH head locks center in position during checking operation. Indicator support is manipulated with one hand when moving it away from work for loading and unloading and against work when checking for runout.

Center holes of both RH and LH heads are bored together for accurate alignment. A longer lifetime of accuracy is assured by the heavy ribbed base, which prevents a deflection under clamping and unclamping.

The Center is compact and easily cleaned. It is portable and may be placed on the work bench or on a stand convenient to work. The bed and two heads are in-

cluded as standard equipment and 6x18, 6x36, 12x36, 12x48, 12x60, and 12"x72" sizes are available. A dial indicator with an adjustable holder may be had as extra equipment.

FAST WORKING CLAMP



Mechanics Engineering Co., Jackson, Mich., has developed a new design of clamp that has several interesting and useful features. It is the Cam-O-Lok clamp and is made in three types, for light, medium and heavy duty.

Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS



Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S.—Inexpensive—last for years.

Write for Circular
NIELSEN TOOL & DIE COMPANY
1962 W. Eleventh Mile Road,
Berkley, Mich.

Gusher

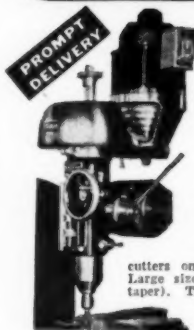
COOLANT PUMPS

Write for descriptive literature

Made in various types and sizes from 1/30 to 2 H.P. Pumping capacity up to 200 g. p. m. Many patented and exclusive features.

THE RUTHMAN MACHINERY CO.
1808 Reading Rd. Cincinnati, Ohio

MILLING - DRILLING - BORING ATTACHMENT for Heavy Duty Operations



Easy Mounting

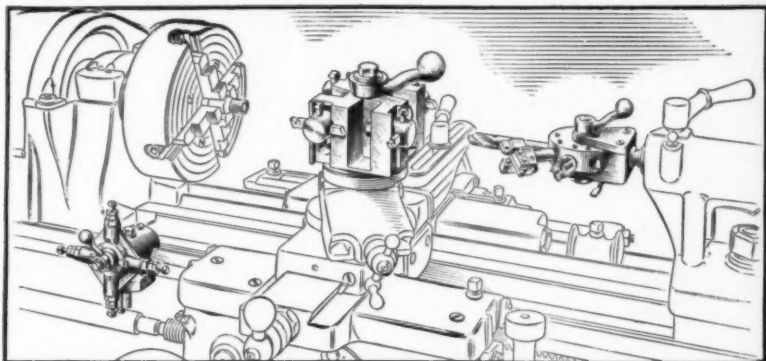
Large Quill — 4" travel
counter balanced, hardened, and ground
6 speeds
250 - 3000 RPM
Lever and Worm Feeds
1/2 H.P. Motor

Specially engineered by RUSNOK to meet the demand for heavier duty and mill operations. Uses many types of cutters on a wide range of work. Large size spindle (No. 9 B & S taper). Takes 1/16" to 3/4" end mills. Precision Engineered and Ruggedly Constructed Throughout.

Write for descriptive folder.

RUSNOK TOOL WORKS
4840 North Avenue, Chicago, Ill.

To convert engine lathes into turret lathes...



HERE'S ALL YOU NEED...

CROSS-SLIDE TURRET — for multiple machining operations on the same lathe. Gives you four different working positions without tool changes. No. 30 for 9" to 11" lathes; No. 60 for 12" to 18" lathes.

TAIL-STOCK TURRET—quickly converts engine lathe into 4-way turret lathe for end work. No. 58 with No. 2 Morse Taper

Shank; No. 103 with No. 3 Morse Taper Shank; No. 104 with No. 4 Morse Taper Shank.

LATHE STOP—you measure only once for each operation, thus saving valuable time. Once the four measuring positions are set, you just index. No. 10 for 9" to 12" lathes; No. 20 for 13" to 20" lathes.

Write for further information.

SPECIALTIES MANUFACTURING CO., INC.

25 Farrand Street, Bloomfield, N. J.

Makes Old Taps Cut Like New!



READING TAP GRINDER

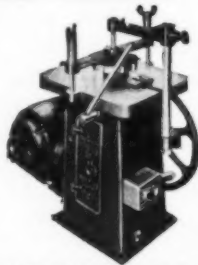
Can be used on almost any type of tool and cutter grinder, surface grinder—even bench lathes. Tap is held in chuck—may be sharpened after center is destroyed. No collets. Complete. No extras. Write!

- Built-in chamfer protactor.
- Simple shifter for 2-3-4 flute taps.
- Variable relief thru adjustment screw.
- Easy - to - follow chamfer diagram on index plate.
- Capacity to $\frac{3}{4}$ " hand tap.

ORDER NOW!

Also manufacturers of READING BROACH KEYSEATER

The Reading Bench Machine does not require bushings or guides. No other machine like it. Very fast capacity from $\frac{1}{8}$ to $\frac{3}{4}$ cutter. Low first cost — prompt delivery.



READING MACHINE CO.

READING (CINCINNATI) OHIO

The clamp is instantly adjustable over the entire range of its vertical holding capacity. When objects to be held vary in thickness, no adjustment of the hold-down bolt is necessary to obtain the desired clamping pressure. Locking and unlocking are accomplished by means of a threaded element in the positioning handle. Lubrication is provided for the threads.

Cam-O-Lok Clamps are compact in design. All dimensions have been held to a minimum, to permit their use in assembly and holding fixtures where space is limited.

INGERSOLL GRINDING CHART

An attractive new Grinding Chart giving basic grinds for standard milling cutters has been issued by the Ingersoll Milling Machine Co., Rockford, Ill.



This chart should go a long way towards helping to correct some of the difficulties experienced in the use of milling machines resulting from improper grinding of the cutters. The chart is 15"x23" and it shows a number of basic grinds for use on different types of material. The charts are suitable for mounting in conspicuous places in tool rooms and they are available for free distribution on request.

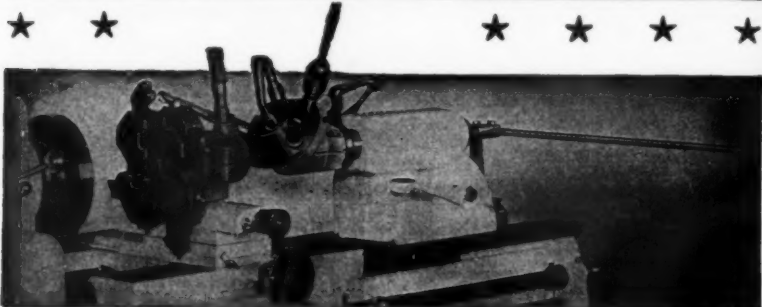
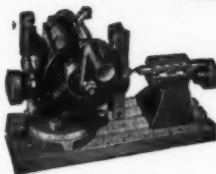


Photo above shows Jefferson Turrets on 16" lathe



7 1/2" Swivel Base Dividing Head — In Stock
IMMEDIATE DELIVERY
No Priority Required



6" Tilting Dividing Head with 3 Indexing Plates and Tailstock—
Immediate Delivery.

Some territories still open
for dealers and salesmen.

Convert YOUR ENGINE LATHE INTO A TURRET LATHE IN 15 SECONDS

Yes, it's as easy as that!

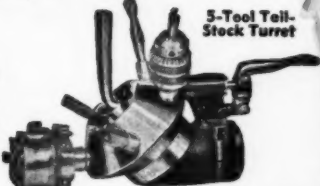
You simply attach the Jefferson Tail-Stock Turret, the Jefferson Tool-Post Turret, and the Jefferson Adjustable Pull Feed to your lathes as shown in illustration.

The productive capacity of these machines will be more than doubled in many instances because there will be available at all times **NINE DIFFERENT TOOLS.**

With these three JEFFERSON time-saving devices attached to a lathe, any kind of work may be done, such as forming, roughing, boring, finishing, knurling, drilling, tapping, etc., without stopping the lathe, or changing tools. THE JEFFERSON TURRETS are made very substantial, rigid, accurate and in several sizes to fit small bench lathes up to 24" swing.

Jefferson Turrets are real production tools—substantial, rigid, accurate and adaptable to any size or make of engine lathes. They must not be confused with the small makeshift gadgets now on the market.

TURRET DELIVERIES IN 6 DAYS



5-Tool Tail-Stock Turret

PAT. PENDING



4-Tool Tool-Post Turret

JEFFERSON MACHINE TOOL CO.

700 W. Fourth St.,

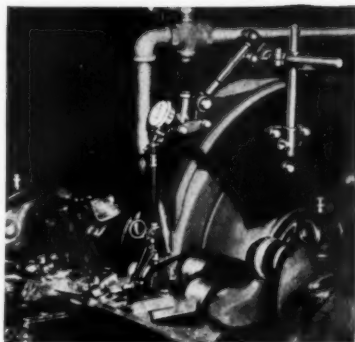
Cincinnati 3, Ohio

Tool-Post Turrets, Tail-Stock Turrets, Adjustable Pull Feeds, Belt Sanders, Gyrotray Foundry Riddles, Overhead Swing Frame Grinders, Milling Machines, Dividing Heads and Vices.

VISUAL DIAMETER CONTROL

An improved Pratt grinding gauge, which continuously measures the diameter of external cylindrical jobs while work is in progress, and automatically indicates the point at which correct diameter is reached, is announced by American Diamond Tool & Gauge Co., 15920 Woodingham, Detroit 21, Mich.

The improved gauge is said to provide also a continuous visible check on out-of-roundness and the amount of error. Perfect roundness and accuracy of diam-



eter within .0001" are said to be easily maintained, even by semi-skilled operators, thus eliminating scrap.

The gauge is adapted both to straight and tapered work. A special feature is that work is also automatically measured while stock is being removed, thereby saving the time of further calipering. At

BURR KEYSEATERS



Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

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YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens, Inches	Weight, Pounds
1D	3 1/2	3 1/2	12 1/2
2D	5	5 1/2	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY
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RECLINABLE POWER PRESSES



We manufacture a complete line of mechanical power presses, with sizes and types for every need in your shop.

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ZEH & HAHNEMANN CO.
Newark, N. J.

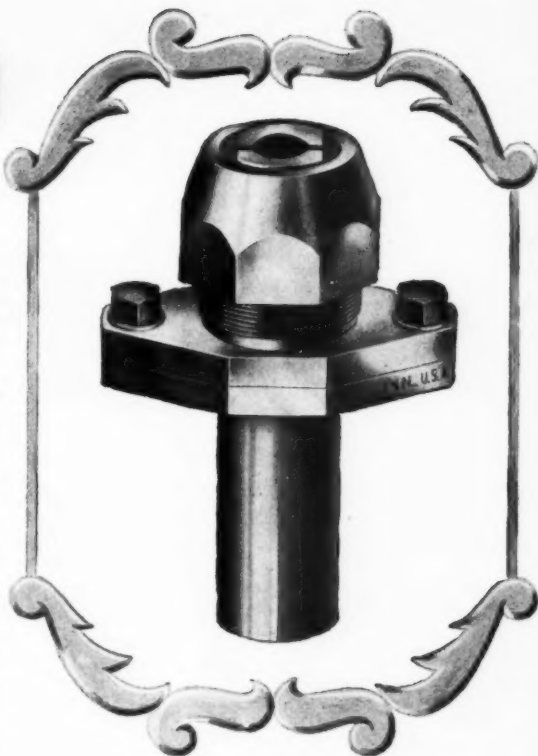
ALCO

Screw machine operators find simplicity and accuracy combined to the highest degree in Alco Tool Holders.

The Alco Drill Chuck shown here will fit all makes of screw machines—old or new, and holds Drills, Reamers, Counter Bores, etc. firmly and securely *without the use of bushings*. This feature alone saves hours of valuable time now wasted in making special bushings, and eliminates entirely the necessity for carrying an inventory of possibly 250 bushing sizes. Saves set-up time, too, because the drill is set directly in the chuck and tightened with the wrench.

All Alco Tool Holders have the patented floating feature which insures absolute concentricity. When setting up for the drilling operation, it is simply necessary to center the drill on the work, tighten two screws on the flange, and the drill remains constantly on center.

Each holder expands to take several drill sizes within its capacity.



ALCO DRILL CHUCK

Remember!

No Bushings Needed

Write for Catalog

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EFFICIENT

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PHILADELPHIA 3, PA.

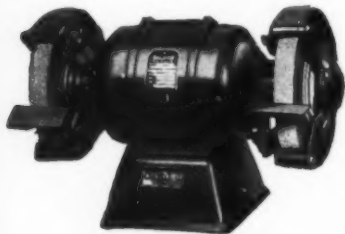
no stage of operation need machine be stopped for hand caliper.

The standard model, as illustrated, measures diameters from 5/16" to 27". Special gauges, as for side wheel grinding, are made to meet individual requirements.

A descriptive bulletin is available on request.

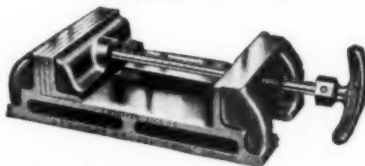
BALDOR 7" GRINDER

The Baldor Electric Co., 4368 Duncan Ave., St. Louis, 10, Mo., announces development of a new 7" unit described as their 7100 series grinder. According to the manufacturer this new development



features:—specially designed motor which is cool running when carrying normal load with 100 % overload capacity; pre-lubricated ball bearings which require no lubrication during their entire life; first grade wheels balanced with Baldor patented balancing flanges. Bulletin No. 318 giving complete description will be sent upon request.

V-6 TWISTITE VISE



A new model V-6 Twistite Vise has been developed by the J. A. Richards Co., Kalamazoo, 13F, Michigan. The new vise features heavy duty construction and extra capacity with the familiar Richards Twistite unit for quick clamping action.

The jaws are 6" wide, 1 7/8" deep, opening 6". Overall length is 15 1/2", overall height, 3 3/4".

ALL ALLOY PORTABLE SHEARS

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Two Sizes

No. 1 cuts up to No. 11 gauge strip or sheet.
No. 2 cuts up to 3/4" steel plate.

Special Blades for shearing stainless steel.

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NEW LOW COST DRILL GRINDER

Anyone can do expert drill grinding with this simple-to-use drill grinding attachment—fits on any bench grinder—saves buying new twist drills—saves time and materials that dull bits waste. Grinds bits from 3/16 to 1 1/4. Write for FREE literature.



T & H MFG. CO.
811 E. 31 St.
Kansas City, Mo.

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With The
**BOX MILL CUTTER
GRINDING FIXTURE**

You no longer need to use a skilled grinder hand to keep your cutting tools in good order. This new fixture will enable an apprentice to grind **BOX MILL CUTTERS** with complete uniformity and absolute accuracy.

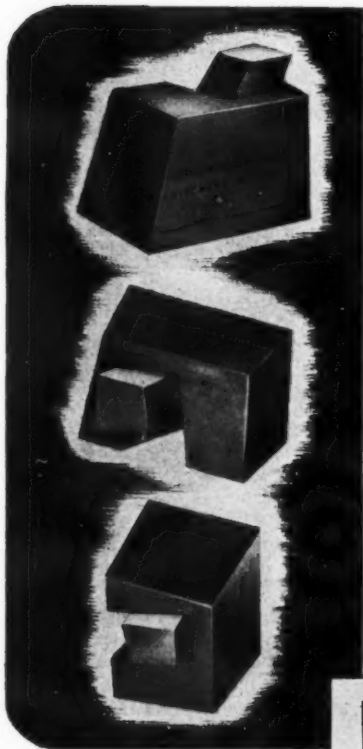
All angles on the cutters are predetermined by the hardened and ground sides of the grinding fixture thus assuring you a minimum of grinding and no repetition of work to correct errors.

It not only enables you to grind cutters faster but gives more grinds per tool bit.

PRICE . . . \$32.50

This fixture is intended for Warner & Swasey and Gisholt Single Cutter Turners up to 1" x 1 1/4" shank in both High-Speed and Carbide Tipped Tools.

WRITE FOR FURTHER PARTICULARS



**EQUIPMENT
MFG. INC.**

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SILICONE INSULATION PERMITS INCREASED RATINGS

As much as 50% reduction in weight of electric equipment is possible where design limitations are based on insulating temperature by using the new Silicone insulating varnishes. These high temperature insulations also make possible a substantial increase in the output of small motors using the same frames, where the operating temperature can be raised.

They offer the additional advantages of ability to operate at higher ambient temperature, and to increase life greatly when operated at present temperature conditions. Silicone resins, and their use as insulating varnishes and bonds, definitely fill the void between organic and inorganic insulating materials.

Westinghouse reports that over two years' experience on actual equipment confirms extensive laboratory tests which



showed these materials to be promising. For example:—To meet a very special requirement, a 3 hp totally enclosed induction motor was redesigned for 10 hp with no increase in weight or size. Since then, more than 30 similar motors using high temperature insulation have been

Take a minute to follow the arrows showing the holding circuits of this NEW chuck. The blocks shown are only plain steel. No need of "magnetic-blocks" when using this new "POWER-GRIP" circuit. Think how this can help you hold irregular, odd or real small pieces.

These small pieces have been ground true with the shoulder without extra jigs or fixtures — by spacing the chuck and parallel.

An electric chuck—plug control into 110 Volt A.C. chuck is only 6 Volts D.C. no heat—never burns out.

Send parts or prints for our suggestions. Card brings illustrated catalog. Chucks, including trouble free power control units, in stock.

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CADILLAC

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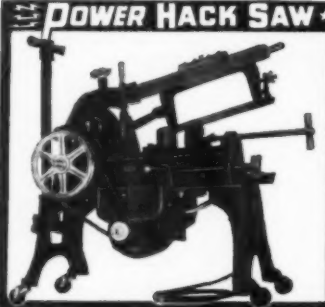
If you are unable to get the gages you need from your customary source of supply, send a wire to Cadillac. You'll be pleased not only by our promptness in delivery but also by the quality and accuracy of the gages that you receive.

National Coarse
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POWER HACK SAW



Low Priced Self-Contained
Portable
 Ready to Work—Economical
Sturdy

Write for Bulletin No. 100

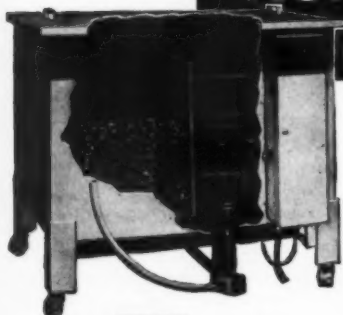
MILLER-KNUTH MFG. CO., OMAHA, NEB.

built and are now being tested under various conditions. A mine locomotive motor armature has been functioning perfectly under very adverse conditions for over a year since being rewound and high temperature insulated. Prior to this, insulation failures occurred frequently, a few less than a month apart. Street car and trolley coach motors with Silicone insulation have been given exhaustive tests at elevated temperatures. Results show increased hp output at no increase in speed with no injury to insulation.

The motor shown on the left is twice as large as the one on the right, both produce 10 hp at 1750 rpm. Higher operating temperature makes this possible. The left hand motor is made with Class A insulation and operates at 105° C. total hot-spot temperature while the right hand motor is insulated with high temperature silicone. The left hand motor weighs 410 lbs and the right hand motor weighs 210 lbs. (Photo—Courtesy Westinghouse Electric & Mfg. Co.).

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Small, accurately machined pieces, like this airplane-engine part, turned out by Ace, have given this country of ours the overwhelming striking-power to restore peace. Starting from solid bar-stock, it is rough-machined, carburized on the outside, drilled, then hardened and ground.

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"FLUD-LITE" MAGNIFIERS



Stanley Electric Tools, New Britain, Conn., now offers an attachment for the "Flud-Lite" Magnifiers Nos. 701 and 701H —an auxiliary lens, No. 05, which doubles the magnifying power of these popular Stanley inspection tools, equipped with fluorescent lamps. Use of the auxiliary lens is recommended for close inspection work and assembly of small parts whenever additional magnification is required. Lens is $2\frac{1}{2}$ " in diameter and is set in a cup-shaped frame. Fits easily right under lens frame of Magnifier and can be attached or removed in a few seconds' time. No. 05 Auxiliary Lens will fit any Stanley "Flud-Lite" Magnifier No. 701 or No. 701H.

Back the Attack!

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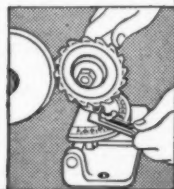
NEW TOOL GRINDER

Grinds Milling Wheels, Slitting saws, Lathe Tools, Wood Turning Chisels, Many Small Tools to any Degree or Angle.

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TURNER
UNI-DRIVE
Motorizes Machine Tools

Keeps Machine Tools Hustling

- 1** No belts to shift. Drives to large step of cone at all speeds.
- 2** Eliminates overhead line and counter shafts.
- 3** All advantages of geared head, with belt drive smoothness.

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Super Sensitive
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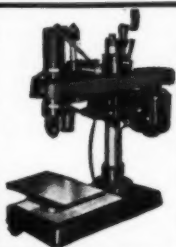
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PRECISION DRILLING

Quicker — Cheaper

For holes from .004 to .250" diameter . . . this drill gives you precise, clean holes . . . drilled quicker at lower cost per job.

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Ninth and Hanover Streets.
HAMILTON OHIO



ANGLE RADIUS DRESSER

The U. S. Tool & Mfg. Co., 6906 Kingsley, Dearborn, Mich., has applied for patent on a new precision Angle Correcting Radius Dresser No. T-124 that not only does the work of a radius dresser but is also designed to dress the corrected radius on a wheel for grinding compound and compound-complex forms on flat form tools, etc. This dual-purpose tool employs the direct-reading principle, eliminating guess work (cut and try) from this type of wheel dressing. The procedure is (1) to swing diamond dresser arm mechanism thru the specified number of degrees, as indicated on graduated scale located at right angles to dressing axis, and lock in position. Reading is taken directly from print and if a 20° relief angle is specified, the Dresser is set at 20°).

(2) Dresser is then put on chuck, exactly on center-line of wheel—and it is dressed to radius required. For compound-complex angles, the same procedure is followed with the addition of swinging base of dresser away from parallel bar of chuck, using upper right hand corner of base of Dresser, as pivot point, directly reading angle (from blueprint) as before.

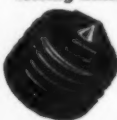


The tool is light in weight, yet sturdy in construction to assure smooth and precise radii. Both angle scales are easy to read and easily accessible. Dresser is constructed with a hardened tool-steel wear plate on under side of base to prevent chipping and wear of cast iron body. Fitted with Timken taper roller bearings and a one piece hardened steel spindle arm, this angle correcting radius dresser is a thoroly engineered precision instrument.



A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.



The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in 1/4" to 1" diameters. Send for price list.

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Immediate Shipment STEEL BOXES



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STYLE 600 STACKING BOX

A straight side shop box with drop handles each end. Excellent for shop use where stacking feature is not required.

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An ideal all-purpose shop box. Sturdy all-welded construction. Heavy skids act as positive stacking lock and re-inforce box at point of maximum wear.

No. 601—10"x16"x6"—16 ga., \$.95 Ea.

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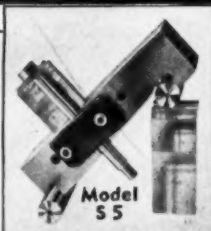
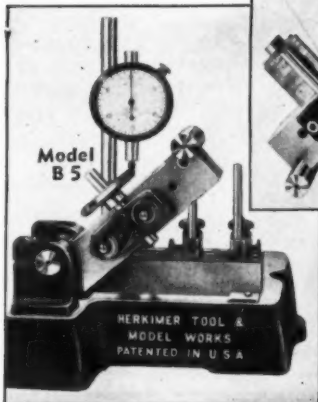
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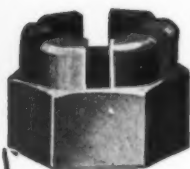
With one set-up on these tools, any operator with ordinary gauging experience and a knowledge of blue print reading, can perform these

three important operations:

1. Check dimensional accuracy of the addendum cone (gear face) as related to thrust face of hub.
2. Check accuracy of cone angle.
3. Check run-out of gear face.

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DOALL COMPARATOR

A basic feature of the new DoAll Comparator is its wide range of magnification, which enables one comparator to do the work which formerly required as many as four standard comparators. To accomplish this, instrument has four magnification ranges, enabling work to be checked over a wide range of tolerances. For example, a work piece may be checked to determine size variations of one-millionth-inch and on the same Comparator, a work piece can be checked to determine size variations as great as four-thousandths of an inch.

The spindle is equipped with variable pressure adjustment to provide the exact pressure required for measuring thick or thin sections, as well as for hard and soft materials.

Spindle movement is magnified electrically. This feature assures exact repeat readings, since there are no moving parts which could cause spindle to stick or bind. Spindle head is provided with an adjusting collar for raising to accommodate the work and is also provided with a hair-line adjustment knob for

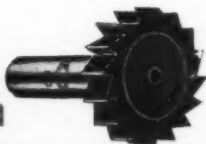
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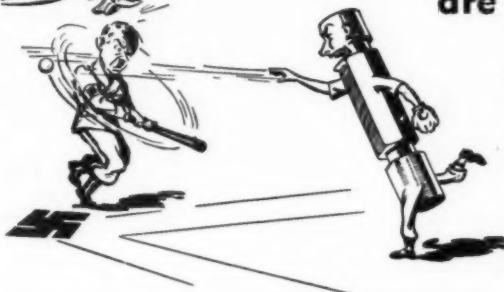
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PITCHIN'



THREAD PLUGS
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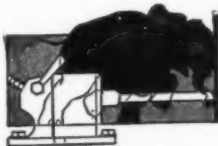
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Announcing
MEAD
MIDGET
AIR
CLAMPS

*Horizontal and
Vertical!*



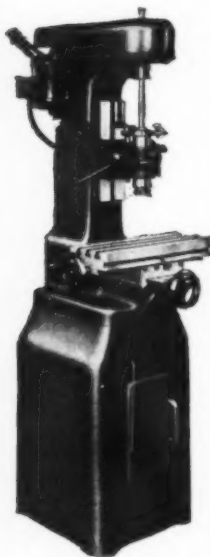
Both models deliver 80 lbs. pressure on a line pressure of 100 lbs. They'll save countless man-hours in assembly operations involving welding, riveting, bolting, etc. *Advantages over mechanical clamps:* 1. Any number can be operated by single master valve. 2. Easily installed in cramped corners. 3. Equal ram pressure at any stroke point. Send for new Mead AIR POWER Catalog, describing our line of Air Clamps, Air Vises, Air Presses, Work Feeders, Valves, Controls, etc.

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Things HUM

... with this machine

ON THE JOB



One of the best ways to turn confusion into order, in a busy toolroom, is to install the LINLEY. The fussy little jobs melt away fast and your larger machines are reserved for bigger jobs.

Milling, Jig Boring, Metal Patterns, Models, Jigs, Dies, Reaming, etc. can be performed on this sturdy little machine to greatest advantage. Set-up is fast, changeover easily made from one type of work to another, table size is ample (7" x 17½"). eight speeds from 275 to 4250 r.p.m. give you plenty of choice and the compact LINLEY design

requires but 18½" x 20" floor space.

In all respects the Linley is a precision machine. Velvet feed is guided by a direct micrometer setting and backlash of quill travel eliminated by a counterbalance. For "clearing the decks" and keeping them clear, we suggest the installation of a LINLEY... a profitable investment in any shop.

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LINLEY BROS. CO.

663 STATE ST. EXTENSION
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setting indicating pointer on Comparator dial. Gage head swivels 360° in horizontal and vertical planes, making it a simple matter to check irregularly shaped parts or multiple jig fixtures. Protractor shows angle to which gage head is tilted. Gage head can be removed from stand and used on a surface place, machine tool, multiple gaging fixture, or for any other special application.

A substantial broad, heavy base houses the calibrated dial. Both work anvil and calibrated dial are at equal distance from operator's eyes, making it easy to insert work under spindle and read indicating pointer on the dial.

The differential electrical circuit used minimizes expansion due to temperature changes and drifts due to line voltage fluctuations.

Three models are offered, each having four ranges of magnification.

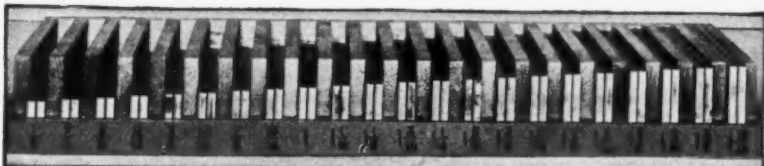
Complete information and specifications are available from Continental Machines, Inc., 1300 Washington Ave. South, Minneapolis 4, Minn.



The GLENNY Adjustable-Expansion BROACH

Produces low cost, accurate keyways. Eliminates set-up time. Self aligning. Interchangeable parts. Adapted for arbor press, mechanical or hydraulic pressure. Speeds up production. Cuts bars in carbon or high speed steel. Details? Write!

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Hardened and Ground
Length 6"
Within .0001" in parallelism
and straightness on ground sides
About .040"
Rockwell C 64 \pm 4

Sold to consumers only

COMPLETE SET OF 22 PAIRS from $\frac{1}{4}$ " to 1-13/16" in height in steps of $\frac{1}{16}$ ", with case, as illustrated, \$85.—net, F. O. B. New York, N. Y.

Sold in complete sets only and **ON MONEY BACK GUARANTEE**
THE MOST IDEAL SET OF PARALLELS WHICH SHOULD BE IN EVERY TOOLROOM AND INSPECTION DEPARTMENT
IMMEDIATE DELIVERY ON HIGH PRIORITY.

EASTERN MACHINE AND TOOL COMPANY

170 Broadway

Tel. Cortlandt 7-3579

New York 7, N. Y.

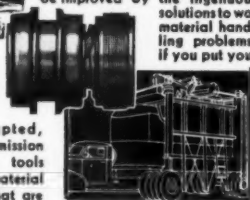


PULLMORE CLUTCHES

provide easily adapted, compact power transmission control for machine tools and many types of material handling equipment that are speeding production and avoiding wasted man-hours.

HOW LST CLUTCH Solutions BENEFIT SPECIAL Material Handling TRUCK DESIGNS

Your peacetime products can be improved by the ingenious solutions to war material handling problems, if you put your



power transmission requirements up to our engineers.

Send for These Power Transmission Bulletins

They show how PULLMORE Multiple Disc CLUTCH exclusive features are being used to give post-war products competitive advantages. Give capacities,



dimensions and specifications. Contain application diagrams and photos of PULLMORE equipped machines.



Rockford Drilling Machine Division

Borg-Warner Corporation
1309 Eighteenth Ave., Rockford, Ill.

USE ROCKFORD INDUSTRIAL CLUTCHES FOR SUPERIOR PERFORMANCE AND ECONOMY

Machine Tools	Process Machinery	Farm Implements	Materials Handling	Earth Movers	Service Machinery	Power Units

Pullmore Multiple-Disc Clutches • Over-Center and Spring-Loaded Clutches • Power Take-Offs

SELF-TAPPING SCREW MANUAL

Much useful engineering and production data about the application of Self-tapping Screws is given in the new Users' Guide, offered by Parker-Kalon Corp. to design engineers, chief draftsmen and production executives.

The 18 pages are of file size, tab-indexed, spiral bound, and arranged with a strong wall hanger. The guide includes a selector chart which tells at a glance which of the nine types of Self-tapping Screws to use in various materials. Clear tables give recommended hole sizes, stock sizes and data on use of each type of P-K Self-tapping Screw under different conditions.

Application information covers use of Self-tapping Screws in sheet metal, steel, castings, plastics, plywood, asbestos and other compositions.

Also shown are special heads and special forms of P-K Self-Tapping Screws which can be made for specific needs.

Because of the paper shortage, and costliness of the unit, distribution must be limited to engineering and production executives, who can obtain copies from Parker-Kalon Corp., 204 Varick St., New York 14, N. Y.

H-P-M PRESSES

A pamphlet on "Faster Speeds for 194X Metal Working Production" has been published by The Hydraulic Press Mfg. Co., Mount Gilead, Ohio. It asserts that H-P-M Fastraverse Presses assure fewer rejects and faster production, which is the answer to the problem of producing postwar metal products faster. These presses have rapid two stage action with closing and opening movements at the rate of 1200 to 2100 inches per minute. Full tonnage drawing speed is at the rate of 330 inches per minute or more, for the entire length of draw. The bulletin offers an answer to problems in sheet metal forming, powder metallurgy, forging, die casting, etc.

TALIDE-TIPPED CENTERS

An attractive new 4-page catalog No. 44-C has been issued by Metal Carbides Corp., 107 E. Indianola Ave., Youngstown, 5, Ohio. This folder should be of interest to all users of lathe and grinder centers because it is said to set up for the first time, complete standards on carbide tipped, half centers, and stub centers. Complete prices and specifications are given on the standard sizes and styles available.

**Will Not Mar
Metal or Plated
Finishes —**

The New PYRALIN TIPPED MALLET

The only Pyralin Mallet on the market with threaded tips replaceable by hand. Plastic tips are quickly and easily screwed into the solid "non-sparking, non-magnetic alloy heads" when replacements become necessary.



These handy shop tools take the place of rawhide, wood and copper mallets — and do a better job. Oval hole drilled in head prevents handle from turning or coming off. Widely used in aircraft and war industries. Let us send bulletin giving sizes and full information.

SOUTHWEST MFG. CO.

**1615 EAST FIRST ST. - Dept. B-8
P. O. BOX 776**

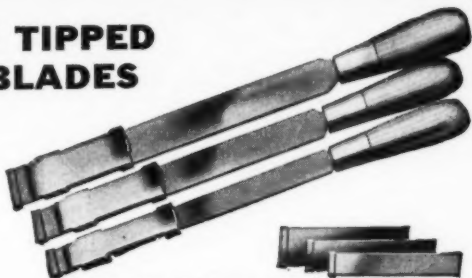
SANTA ANA, CALIF.

CARBOLOY TIPPED SCRAPER BLADES

Available in three widths to fit the Anderson standard line of hand scrapers. Simply remove the high-speed steel blade and slip in the Anderson Carbology Tipped Blade.

If you are already using Anderson Hand Scrapers it is not necessary to buy complete new scrapers in order to use carbology tipped blades.

Speed up your scraping operation with



THEY LAST 8 TO 10 TIMES LONGER

these more efficient, longer lasting blades. They are especially good for the new hard alloy iron and the extremely hard bronze castings used in war equipment.

Write for
BULLETIN 85

ANDERSON BROS. MFG. CO.

Anderson

ROCKFORD, ILL. U.S.A.

Buy More
BONDS

dependable performance with

Janette
SPEED REDUCERS

JANETTE SPEED REDUCERS

Your **SLOW SPEED** machines of from **.08 r.p.m.** and higher, **1/50 to 10 H.P.**, can be driven without using belts, pulleys, line shafts, chains, sprockets or slide rails, if you use one of the **47 types** of Janette speed reducers.

WRITE for our 100-page Catalog **TODAY.**

Janette Manufacturing Co.
556-558 W. Monroe St.
Chicago, Ill.

NEW DRIVE-ALL UNITS

Drive-All has developed a complete unit especially designed to drive Brown & Sharpe automatic screw machines and automatic turret forming machines. These units are built to provide the many special operations which such machines are designed to perform.

Each unit is assembled for the specific model it is to drive, including both standard and high speed models. An infinite range of speeds is available to the machine operator and these include standard reversing speeds. Also standard constant speeds are available to the backshaft as required by various models.

The units are built to make speed changes easily and accurately. They provide long driving center distances between the output pulleys on the transmission and the spindle and backshaft pulleys on the machine. Mounted on a 6" diameter column with 16" base, these units are rigid and vibrationless.

Each bearing includes accessible grease fittings and all pulleys are keyed to shafts. Standard motor, V-belts, sheaves and pulleys are used in each assembled unit, and each unit is completely assembled and crated for shipping at the factory.

It is possible to install drives on machines before overhead line shaft and counter shafts are removed, thus permitting conversion without interrupting other machines or production.

Complete information with reference to this unit may be had from Drive-All Mfg., Co., 3400 Conner Ave., Detroit 14, Mich.

ENGINEERING DATA

Ordinarily catalogs are intended to promote sales. However, Catalog M-1322, recently issued by the Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio, is a non-selling publication unless you consider service, good will and engineering cooperation as a component of the selling effort.

This milling, grinding and broaching material was compiled for tool engineers, plant layout men, and methods engineers; fellows who want nothing more than engineering data minus descriptive texts and spare adjectives.

The catalog provides 60 pages of helpful engineering information pertaining to the products of this company, including dimensional drawings, and specifications. It contains in handy reference form, the useful engineering information frequently required in production planning. A streamlined index facilitates reference.

"STAR DUST"

LABORATORY GRADED
PURE DIAMOND POWDERS

Precision LAPPING POWDERS for PRECISION Work.

GAUGES — TOOLS — DIES — Etc.
with tremendous saving of time.

These are the factors which make STAR DUST indispensable in lapping and superfinishing operations on HARD STEELS, TUNGSTEN CARBIDE and Chrome.

- Absolute control of particle sizes
- Complete absence of out-size particles
- STAR DUST sizes as fine as .0001"
- Complete range of grit sizes

Consult us about your lapping and super-finishing problems.



STAR DUST speeds up production enormously and produces finishes and super-finishes down to less than .0000004 of an inch.

ACE ABRASIVE LABORATORIES

ONE SPRUCE STREET
NEW YORK 7, N. Y.

**IMMEDIATE DELIVERY
FROM STOCK
ON STANDARD SIZES**

**HIGH SPEED — PRECISION
CENTER
DRILLS**



Attention!

ALL SCREW MACHINE HOUSES

Here is just what you have been looking for. A High Speed, accurate Center Drill that guarantees a perfect center every time.

No longer is it necessary for you to cut down one of your drills for centering purposes. These tools are designed to give long and dependable performance.

**SINGLE END—RIGHT AND
LEFT HAND AVAILABLE**



Satisfaction assured on a complete stock of all types of standard cutting tools and end mills.

**Prompt Delivery on Special Tools, Dies,
Jigs and Fixtures Made to Your
Exacting Requirements.**



Write for prices on standard sizes or submit blueprints for special sizes.

Galter Manufacturing Co.
711 W. Lake Street Chicago, Ill.

EXCELSIOR



**REVERSIBLE SHEAR, PUNCH
AND PRESS No. 10**

Expensive dies can be eliminated and readjusting of standard production machines avoided thru use of this machine. It provides the necessary facilities in large production plants for completing patterns, jigs, templates, samples, etc.

It is also indispensable in job shops where sheet metal is fabricated, involving punching of holes or shearing of openings in any location to the center of 42", on sheets up to No. 12 gauge.

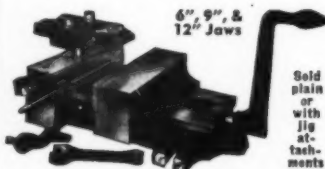
Many jobs can be entirely completed on a single No. 10 unit, which would otherwise require three separate machines—on operations such as stoves, ranges, signs, cornice and architectural work, store equipment, etc.

This sturdy 800-lb. machine will stand up in hard service and prove a profitable investment in any shop.

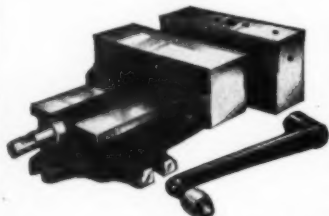
Write today for further details.

EXCELSIOR TOOL & MACHINE CO.
EAST ST. LOUIS, ILLINOIS

**124-lb. ruggedness for planer
or shaper or light-weight sizes
for drill press**



GRAHAM MULTI-PURPOSE VISE



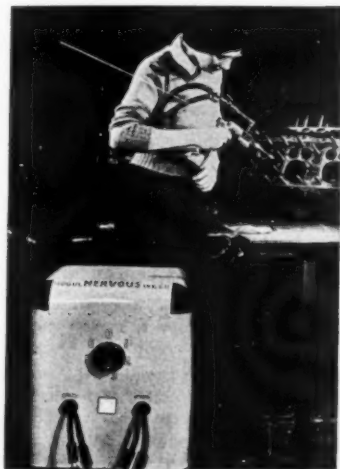
Made in a range of sizes, this Graham tool fills exceptionally well the vise needs of planer, shaper, drill press, miller, grinder, radial, etc. Its four-square, flush, parallel construction is of great help in quick and accurate positioning, while the many jig attachments enable it to be used for innumerable special-holding and repeat-operation jobs for which jigs or fixtures would otherwise have to be made.

Request Illustrated Price Circulars

GRAHAM MFG. CO.
55 Bridge St., East Greenwich, R. I.

MOGUL NERVOUS WELDING

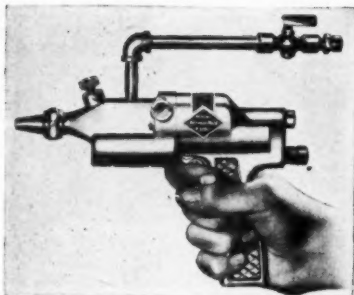
The Mogul Nervous Weld Process is a new development of the Metallizing Co., of America, 1330 W. Congress St., Chicago, Ill. It was developed primarily for reclamation of defective aluminum castings and can be used with equal success in salvaging bronze, grey iron, malleable and steel castings. Other important uses include building-up of surfaces for press fits, repair of cracked housings, motor blocks, pump housings, as well as preparation of surfaces for metallizing.



A complete installation includes a Mogul Nervous Weld Pistol which requires approximately 60 pounds air pressure at 4 to 5 cubic feet per minute and a Mogul Nervous Weld Machine, 110, 220, 440 volts, 60 cycle or 25 cycle, single phase. The latter unit is completely equipped with two 10 foot lengths of cable, male and female receptacle, pair of goggles, heavy duty ground clamp, 20 foot length air hose complete with fittings, wall receptacle and complete instructions.

The pistol deposits atomized particles of metal which are welded to the surface and pressed, leaving a metal which is welded and forged.

Designed for manual operation, the rod (Aluminum, Bronze or Nickel) is fed thru pistol by a trigger control and it is possible to feed $\frac{1}{8}$ " to $\frac{3}{8}$ " with one stroke of finger-grip trigger.



An advantage cited is that it eliminates stresses and distortion in the repair of defective aluminum castings. The temperature never rises above 125° and yet provides a deposit so dense at point of fusion that there is no apparent line of demarcation. Even photomicrographs fail to show the line of demarcation. Aluminum castings, repaired with this unit, machine perfectly and withstand sodium hydroxide solutions used to prepare castings for aluminite plating.

Operating features of the unit include power chamber and peening motor, air-cooled nozzle, which keeps electrode as well as work cooled, finger trigger which permits manual wire feed, needle valve to regulate air supply and electrode lug-connector.

WEIGHT SLIDE RULE



The Dayton Rogers Mfg. Co., 2847—12th Ave., South, Minneapolis 7, Minn., announces a new and improved weight



WILLEY'S

**YOUR BEST
SOURCE OF SUPPLY**
for
DIAMOND TOOLS
and
TUNGSTEN CARBIDE TOOLS

Write for our latest Catalogs

No. 27
Describes and prices standard tungsten carbide tools and tips. Valuable charts of proper cutting speeds for various materials. Special tools and gages.

No. 41
Covers the full line of Willey's diamond tools, diamond and mechanical wheel dressers. Illustrates proper methods of caring for diamond tools.

WILLEY'S CARBIDE TOOL CO.

1340 W. Vernor Highway.
(1) Detroit, Michigan

calculating slide rule. It automatically gives correct weight of any sheet or strip relative to the piece part requirement as used for punch press stock.

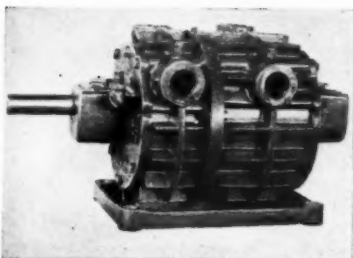
In connection with producing punch press products, the overall weight of a given number of pieces is always required. All that is necessary in this case is to estimate the number of pieces, lineal feet, and the slide rule will automatically give the overall weight accordingly.

While the slide rule is primarily laid out for sheet and strip steel, there is a conversion table for such materials as sheet aluminum, copper, bronze and other sheet alloys. Piece part weight is principally recorded after knowing weight of the stock including the thickness, together with the length required. This will calculate sheet from $\frac{1}{16}$ " to $\frac{1}{2}$ " wide, in thicknesses from .002" to 1", and in lengths from $\frac{1}{8}$ " to 100'.

The new slide rule is handy for calculating weights of all sheet material used in the average punch press department, and is free upon request on Company letterhead.

ROTARY AIR PUMPS

A new two-cylinder pump combines advantages of two separate single-cylinder



pumps as to service, while retaining the compact construction of the single pump.

It is of the rotary type and is used for air pressures up to about 50 lbs per square inch and for vacuum up to about 28.7" mercury. While one cylinder may be used for pressure, the other may be used for vacuum, or both may be used for pressure or for vacuum. One cylinder may pump into the other to increase the air pressure, or one may pump from the other to increase the vacuum as occasion may require. This results in cooler operating pumps than where single cylinders are used.

4-TON CAPACITY BENCH PUNCH PRESS



\$127.50

(less Motor)

F.O.B. Los Angeles

285 strokes per minute • Die Space: $4\frac{3}{4}$ " when Ram "Up" • Ram Adjustment: 1 inch
• Bolster Plate: 6" x 8" • Height: 25" • Weight: 185 lbs. • Motor 1/3 H.P.

*Send for our latest 88-page catalog showing new time-saving tools for machine shops and aircraft industries.



**STAMPS, CRIMPS,
MARKS, PUNCHES,
RIVETS, FORMS**

**Handles Many
Special Operations**

For Light Sheet Metal, Plastics, Etc.

benchmaster—known for quality bench machine tools—aims high speed production with a versatile inclinable 4-ton capacity bench punch press.

MARSHALL TOOL & SUPPLY CO.

1234 SANTA FE AVENUE • LOS ANGELES 21, CALIFORNIA

Made in several sizes, manufacturers of devices requiring air pressure or vacuum or both will find the answer to many of their problems in this latest production in the line of rotaries made by Leiman Bros., Inc., 123-74 Christie St., Newark, N. J.

SENSITIVE HAND TAPPER

A new and larger Hand-Tapper has been added to the Berger Line of Sensitive Hand Tappers, designed for tool-room use as well as for limited production tapping work.

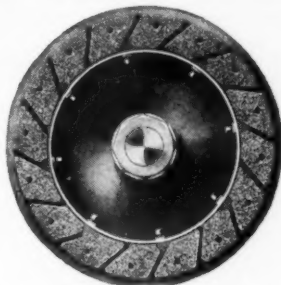
The new Tapper embodies all the features of the smaller $\frac{1}{4}$ " Hand Tapper; has a lapped tapping shaft fitted into a lapped steel bushing and is equipped with a special $\frac{1}{2}$ " capacity tap holding chuck.

The table is 16x16" in size, heavily ribbed underneath and ground smooth on top. Upper arm can be swung out of the way, thus offering an additional bench plate when needed. The round column design facilitates adjustment of tap-holding arm to the left or right, or up and down to the required height, up to 13". Throat depth is 8" and weight of the complete unit is 150 lbs.

A novel feature is offered in the right or left hand ratchet device incorporated



in, and mounted on top of tap spindle. This makes it possible to thread work in a much more convenient way without having to swing the large handle in a complete circle. The operator can thus tap work with much more sensitivity and therefore, less danger of tap breakage.



SWITCH TO THIS SECTIONAL WHEEL FOR Improved Face Grinds

Composed of inserted abrasive sections held in a cast steel chuck. Sections may be advanced to compensate wear. The design of the wheel affords a clean, shearing, high-finish cut, with ample passage for grit and lubrication.

Users of the "Bridgeport" Sectional Wheel invariably profit by

- Faster grinding,
- Better grinding,
- More grinding per abrasive unit,
- Minimum abrasive waste in stubs,
- Lower power consumption,
- Less time consumed in replacing and resetting wheels.

"Bridgeport" Wheels are mounted in 16", 20", 26", 32", 36" and 42" chucks. May we send you complete literature?

Bridgeport
Safety Emery Wheel Co., Inc.
Bridgeport, Conn., U. S. A.

The Berger Line of Hand Tappers is sold exclusively by Tool Specialties Co., Raymond-Commerce Bldg. Newark 2, N. J.

ALL-PURPOSE SAWING MACHINE

The past few years have seen the rapid scientific development of a host of new materials. These new materials and their derivatives embrace a wide range of characteristics. Some are abrasive, others sticky, while still others are soft, spongy, or hard.

This has generated many new shaping problems. As a result, new speeds and cutting tools have been developed to control these material characteristics. The makers emphasize that the innovation of the variable high speed sawing machine marks a new era in the shaping of materials as a production time saver and enlarges the variety of materials which can be fabricated into useful products.

Extensive tests, both in the field and under laboratory conditions indicate that increasing the saw band travel definitely increases production, the quality of the work, and a smoother finish.

Contour sawing has proved to be a most economical process of shaping these materials. The narrow saw bands used cut directly to the layout lines, either

internally or externally to produce multiple parts in one operation or to cut three dimensional shapes.

However, the speed control factor of saw band travel must vary considerably for the type of material being sawed. Super high speeds for one would be ineffective for others. In order to shape to close limits and still obtain a fine finish at a high production rate means that correct speed without vibration must be obtained for each material.

To meet these conditions, Continental Machines, Inc., 1300 Washington Avenue South, Minneapolis 4, Minn., offers a new high speed sawing machine especially adapted for versatile sawing conditions. It is known as the DoAll Zephyr. This company, for many years, has specialized in development and manufacture of metal shaping contour machines. The Zephyr is built on the experience achieved from these machines.

The Zephyr meets these stringent requirements thru its control of high speeds, rigid construction and use of all purpose, narrow, precision cutting band saws.

The Zephyr features a 36" throat depth and 20" work thickness capacity with speed ranges of from 1500 to 10,000 feet per minute. This speed range is infinitely



ANGLE Wheel Dresser

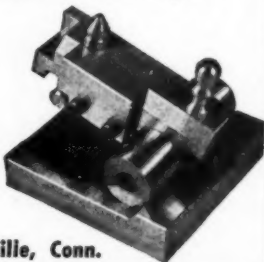
Requires no special equipment or costly set-up for precision dressing of surface grinding wheels to desired angles.

With aid of standard gage blocks or adjustable parallels any angle from 0 to 90 degrees is easily obtained with accuracy of plus or minimum 10 seconds.

The SINE is a ruggedly built precision diamond tool with hardened, ground and lapped bearing surfaces.

Pays for itself quickly. Send for Bulletin 758F.

Manufactured by FLORIAN MFG. CO., Plantsville, Conn.



Order Through . . .

AMERICAN STANDARD CO. Southington, Conn.

HOW AMERICAN INDUSTRY PRODUCES MORE, FASTER, BETTER—WITH BOWSER EXACT LIQUID CONTROL

Here's a Bowser Liquid Control Installation that **PAYS 100% DIVIDENDS ANNUALLY**

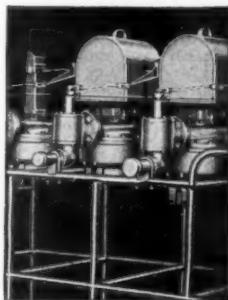
A nationally known plant in New York installed a Bowser 2-meter Soluble Oil Proportioner for grinding and cutting solutions used in seven different departments. Previously the solutions were mixed in open drums and distributed manually.

Results: 1. Three laborers were released for other work. Annual saving—\$9,360.00. 2. Soluble oil consumption was reduced 10%. Estimated annual

saving—\$900.00.

The first year's savings on labor and oil far more than paid for the entire installation. After that, it's "velvet."

That's typical of Bowser Exact Liquid Control equipment. And virtually every manufacturing plant in America has a positive need for *something* Bowser makes... filters, lubrication units, stills, pumps, meters, oil conditioners, solvent purifiers, etc.



BUY WAR BONDS



Not only has Bowser's war production earned the Army-Navy E...Bowser equipment has helped earn it for scores of other companies.



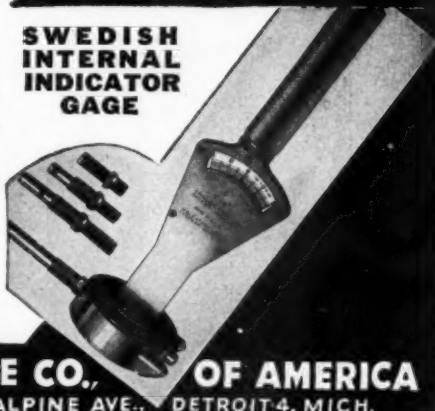
*The Name That
Means Exact
Control of Liquids*

Help Increase Production use the

This light, easily handled instrument when used by machine operators, or on final inspection, serves to increase production, reduce scrap and assure a more uniform product. It is a reliable, precision indicator designed for rapid, convenient and accurate measurement of internal diameters. The scale range is: Plus or minus 0.001" graduated to 0.0001" and minus 0.020" graduated to 0.0001".

It can be set to any required size direct from Johansson Gage blocks or master ring.

SWEDISH INTERNAL INDICATOR GAGE



SWEDISH GAGE CO., OF AMERICA
8900 ALPINE AVE., DETROIT 4, MICH.

controlled by a "Speedmaster" variable speed pulley. A "Job Selector Dial" shows saw control factors for the shaping of 104 basic materials, such as plastics, wood, builders' board, plywood, asbestos, rubber, paper, metal sheet stock, non-ferrous alloy castings, cast iron, and alloy steels. This "Job Selector Dial" and the controlled infinite variable speeds shown by a tachometer speed indicator combine to give the operator correct sawing techniques for shaping all materials.

Automotive hydraulic brakes on upper and lower wheels and all moving parts housed behind walls of steel protect operator at point of work. All operating controls and the pedal for hydraulic brakes are within easy reach of the operator.

Standard equipment includes a 10 hp variable speed drive, a 30"x30" work table with a secondary table extension 17"x20". The machine has a four-way table tilt, 45° to the right, 10° to the left, front, and rear, and an adjustable table lamp for illumination at point of work. Pipe flange arrangements are provided for exhaust removal of chips. Upper wheel is spring tensioned so saw band is under proper tension at all speeds.

Extreme rigidity in the all-welded steel frame is the basis for the precision opera-



**THERE'S NO PRIORITY
ON IDEAS!**

Tom!
See what
"OH-38"
can do for us!

R.M.

Here's Your Metal for Post-War Products...

No matter what products you are planning to make for the post-war era, from heavy machinery to household utility articles, there are component parts which can be made better, faster, cheaper—with OH 38.

It's an aluminum alloy—easily machinable—easy on tools—holds threads without stripping—weighs .106 pounds per cubic inch—elongation 2% to 4%—non-corrosive, non-oxidizing, non-magnetic—does not require heat treatment—polishes to silver mirror brilliancy—takes chrome, nickel or tin plating—may be anodized—many other manufacturing advantages.

OH 38 has proven itself with 5 years use in hundreds of plants and it's used only in castings by Hedstrom. Send for complete technical information



OSCAR W. HEDSTROM CORP.

4830 West Division St., Phone Columbus 3667, Chicago, Ill.

Save Money with a Marschke Multi-Speed Floor Stand

Wheels are the big item of foundry cleaning room costs but wheel costs can be controlled. There are two fundamental requirements:

1st. Constant surface speed for all stages of wheel wear.

2nd. Smooth, vibrationless wheel rotation, no matter how heavy the cutting load.

These two requirements, also safe wheel guards with provision for good dust removal are supplied with the Marschke Multi-Speed Floor Stand.

The two 24" x 4" wheels powered with 10 or 15 HP motor—with three speed changes—housed in a massive one-piece, box-type base casting assure maximum metal removal with minimum wheel wear.

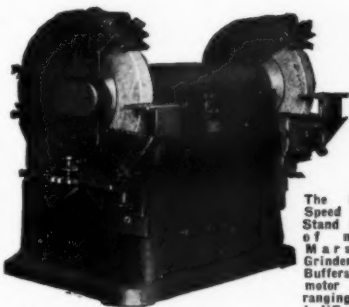
Let us tell you more about the efficient economy of this machine.

Write to

VONNEGUT MOULDER CORPORATION

1805 MADISON AVENUE

INDIANAPOLIS 2, INDIANA



The Multi-Speed Floor Stand is one of many Marschke Grinders and Buffers with motor sizes ranging from 1 HP to 40 HP.



**NO BUCKING
-NO BREAKING**

**What's Your
Cutting Problem?**

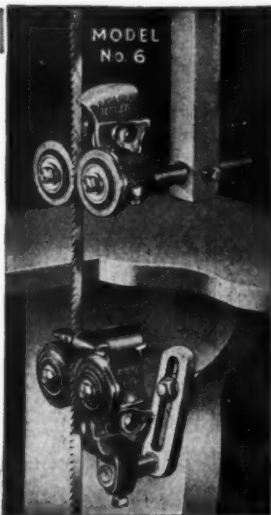
Paddock Ball-Bearing Band Saw Guides enable practically all band saws to cut the toughest materials at top-speed. Thus — your equipment can handle many more jobs than formerly. Blade protection — safety to workmen — greater production are features you'll particularly like in Paddock Guides. Remember — inter-changeable wheels rolling with the blade form the right kind of friction-free support. That's what Paddock Guides give you. Write for 10 Days Free Trial.

PADDOCK TOOL COMPANY

Guide Makers Since 1920
1418 Walnut Street Kansas City, Missouri

Paddock
BALL-BEARING
BAND SAW GUIDES

Guided and Guarded by 6 Safety Points



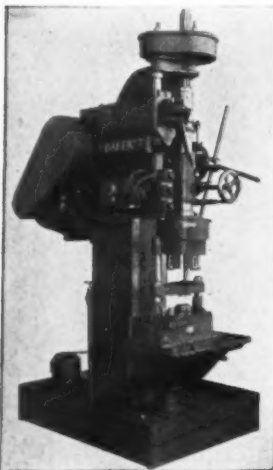
tion of the machine, keeping in true alignment the high velocity bearings which relay this smooth power thru the variable speed pulley to the special adjustable saw guides. These high speed saw guides are adjustable for all $\frac{1}{4}$ " to $1\frac{1}{2}$ " wide saw bands. The machine is shipped complete with 20 assorted saw bands ready for operation.

The Zephyr will accomplish friction cutting on a wide range of metals, providing the exact speed needed for the friction cutting of each different kind of metal. Its versatility extends to the use of various kinds of band saws, such as spring tempered, metal cutting and the new DoAll Buttress tooth saw, since its speed range is wide enough to provide the most efficient cutting speed for all types of saws. The combination of large capacity, variable speed over an extremely wide range and rigid construction that eliminates vibration makes possible the most efficient cutting of any kind of wood, plastics, sheet metal, or solid metal sections, even including die blocks of alloy steel.

CENTRALIZED LUBRICATION

How centralized lubrication systems increase production output of machinery and at the same time make impressive

savings in time, power and lubricating materials, is the theme of Bulletin No. 25, newly published by The Farval Corp., Cleveland, Ohio. This 16-page booklet, printed in three colors, is a graphic portrayal of the theory and practice of mechanical lubrication. It opens with a study of the machinery lubrication problem and of the economies that are inherent in a system which delivers lubricant to all bearings in exact measured amounts regardless of location. This information is faced by a large close-up of a Farval Manual Dualine System at work. There follows an explanation, by means of six cutaway drawings in color, of how the Farval measuring valve operates to deliver a measured amount of lubricant, and why it can do this without recourse to springs, check valves or small ports. The construction and operation of both manual and automatic pumping units, which provide the high pressure source of lubricant supply, are similarly treated. The center spread is devoted to the economics of positive mechanical lubrication; and in the concluding pages a selection of 24 application photographs suggest methods of locating and mounting pumping units and feed lines on as many different kinds of machinery.



LET US SEND BULLETIN
GIVING FULL DETAILS.

BAKER



Model 314-A universal quick change type heavy duty drill press equipped with multiple spindle head and work holding fixture.

This machine is extremely flexible for single spindle as well as multiple drilling operations. The machine as illustrated is equipped with Baker Flange Quill spindle construction for better adaptation of multiple heads. The multiple head shown, furnished by Baker Brothers, is a six spindle head for machining the lightening holes in a popular aviation motor master connecting rod. The machine can be changed over readily to standard single spindle heavy duty drill press of 3" capacity by changing the flange quill spindle assembly to a standard spindle assembly. Standard machine is furnished with six instantaneous quick change speeds and also quick change of feed. Controls are convenient for operator in normal operating position.

BAKER BROS., INC., Toledo 10, Ohio



DON'T GUESS...

Be Accurate with ACME

DRILL JIG BUSHINGS

There's no guesswork when your jigs are equipped with Acme Bushings. On the contrary, accurate drilling is assured, because drill jig bushings from Acme are produced by specialists in precision manufacture.

Acme offers two complete bushing standards, the A.S.A., plus the Acme standard line. Because of this you may be enabled to eliminate many special bushing requirements to save time and money.

You are invited to write for details on Acme's complete line of products and services offered to the precision working field.



ACME INDUSTRIAL COMPANY

Makers of Standardized Jig and Fixture Bushings

210 N. Laflin St.

Telephone: MONroe 4122

Chicago, Ill.

Up-to-the-minute design • readily replaceable steel jaws, covering entire top of vise and PINNED on • exclusive swivel base construction which utilizes the principle of the automobile brake with shoes that grip the sides the full 360° • tension spring which prevents the handle from slipping and pinching the operator's hands • close-grained castings from our own foundry • skillful machining - add up these features and you will know why Parker Vises - America's oldest - are also its best.

THE CHARLES PARKER CO.
Meriden, Conn.

Our renewable tool steel jaws cover the entire top of the vise

We've got an extra strong screw and nut

Our handles stay put in any position

A swivel with the strength of a solid back jaw

Get an eyeful of our improved saddle and underportion

Our jaws grip like a Grizzly

PARKER VISES



America's Oldest

**CHASE THREADS
TRUE & STRAIGHT
WITH THE
RIEGER
DIE HOLDER**



This useful tool is needed in every machine shop. It's built to hold 1" or 1½" O. D. button dies for chasing threads up to ¾" x 3" in a lathe or drill press. Whether you have a single piece to thread or a quantity of them, you can do the work faster and better with the Rieger Die Holder. And you don't have to wait! We have on hand ready to ship immediately a supply of Model DH-1512-MT with No. 2 Morse taper shank. Write for literature and quotation.

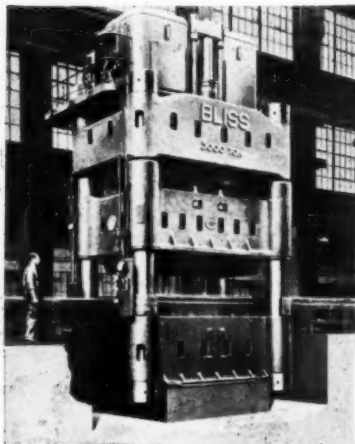
**THE
RIEGER MFG. CO.**

DEPT. MT-8

MIAMISBURG, OHIO

BLISS 5000-TON PRESS

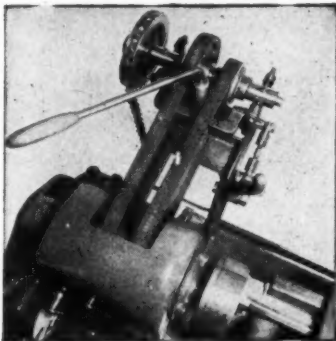
Additional evidence of industry's remarkable contribution to the war effort is a new 5,000 ton Two-Die Slide Hydraulic Press recently installed in a large U. S. bomber plant. Of 5,000 tons capacity, it is said to be one of the largest and heaviest self-contained presses ever built. It incorporates use of the rubber die process so peculiarly adapted to the diversified production of the aircraft industry, with modern material handling devices such as the automatic die slide that was successful on the Four and Six Die Slide Presses.



Outstanding among the features of this press is the automatic cycle which causes die slide to move into its position in 4½ seconds, stroke of the die slide being 168-1/16". As soon as die slide is in position, the press completes a pressing cycle with pressure independently adjustable for each die slide. At completion of press cycle, die slide automatically moves out into its loading and unloading position as smoothly as it moved in. Other features include:—Bliss universal electric control; interlocked safety sequence operation; no master operator required; speedy die slide movement; independent pressure control on each die slide; provision for addition of third and fourth slide; shockless electric drive of die slides; accurate positioning and fitting of die slide to rubber pad; twin hydraulic pumping units and circuits.

DOUBLE YOUR PRODUCTION

with **E. Z. 2-SPEED
FRICTION CLUTCH
COUNTERSHAFT**



Gives instant speed change on Logan, Atlas and other small lathes . . . 2-speeds forward or forward and fast reverse for tapping, reaming, etc. Price complete, \$75.00. Installed in 30-minutes.

E. Z. DRILL GRINDING ATTACHMENT

Sharpens drills in one minute to original factory accuracy. Handles 3/32" diameter minimum, 1" diameter maximum. Thousands used by larger and small war production plants. Type 1—\$5.95; Type 2—\$7.95. Let us send full details.

**IMMEDIATE DELIVERIES
DEALERS WANTED**

E. Z. MANUFACTURING CO.
1709 W. 8th St., Los Angeles 14, Calif.

GIRLS CAN OPERATE

NEW Rouse HAND MILLER FOR SMALL PARTS

\$98

(Without Fixtures)
F. O. B. Chicago
Motor Extra



One of the ROUSE Fixture Set-Ups that
Speed Production

The Rouse Hand Miller is a versatile, efficient, high-speed ball bearing machine for handling light cuts in brass, aluminum and steel.

Rouse Fixture Set-Ups make the Rouse Hand Miller readily adaptable for accurately milling small parts for planes, radios, electric motors, and similar equipment. Spindle will take milling cutters or end mills.

Prompt delivery can be made.
Send for circular.

H. B. ROUSE & COMPANY
2214 N. Wayne Ave., Chicago 14, Illinois

Bed is 50x144x12"; maximum stroke is 40"; floor space overall is 550x170"; height overall is 30½ ft.; Height from floor is 26 ft.

The press was designed and built at the Brooklyn plant of E. W. Bliss Co., 53rd St., and 2nd Ave., Brooklyn 32, N. Y.

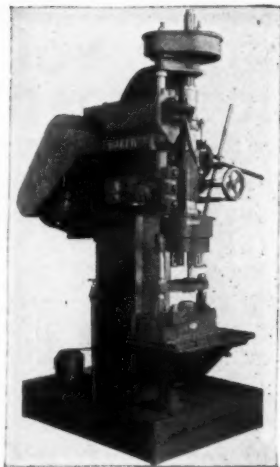
BAKER 314-A DRILL PRESS

A model 314-A universal quick change type heavy duty Drill Press, equipped with multiple spindle head and work holding fixture is offered by Baker Brothers, Toledo, 10, Ohio.

The makers call attention to the extreme flexibility of this machine for single spindle or multiple drilling operations.

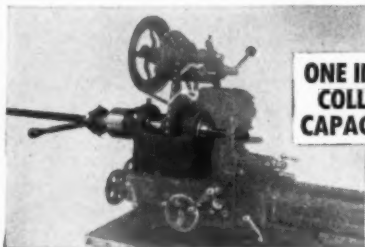
The machine as shown is equipped with the Baker flange quill spindle construction for better adaptation of multiple heads. The multiple head shown is a six spindle unit for machining the lightening holes in a popular aviation motor master connecting rod. The machine can be changed over readily to standard single spindle heavy duty drilling of 3" capacity by changing the flange quill assembly to a standard spindle assembly.

The machines as furnished are provided with six instantaneous speed changes and also quick change of feed. Operating levers are convenient for normal operating position. Reversing controller facilitates



handling of chucking operations.

An attractive new bulletin No. 1000X gives full details and specifications.



**ONE INCH
COLLET
CAPACITY**

**Convert Your ATLAS
or LOGAN LATHE
for Hand Screw
Machine Operation**

**with the . . .
RECOR HEADSTOCK
AND COLLET CLOSER**

The hardened and ground spindle is mounted on Timken Tapered Bearings. Collet sets right into spindle, eliminating need of an intermediate sleeve.

Collet closer parts are hardened and ground where necessary. They are precision machined. Materials are of exact specifications required for maximum performance and life.

All holes in Headstock are drilled and tapped ready for mounting. Backgears on Headstock are eliminated. A gear is mounted on spindle permitting use of the screw feed for cutting, threading operations, etc. Speed variation is provided by a three step pulley mounted on spindle.

Recor equipment will pay for itself many times over in increased lathe production. Permits feeding and releasing of bar stock from ½" to 1" inclusive through the collet without stopping lathe. Gripping action is adjustable to desired tension without loss of time.

See your dealer or write to us for literature.

RECOR MANUFACTURING COMPANY

**430 SO. GREEN STREET
CHICAGO 7, ILLINOIS**

Manufactured by

USE

Fluid-Motion for Modern form-dressing

ONE

**SETTING
HANDLE
CONTINUOUS MOTION**

The J & S Model "E" Radii and Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable—regardless of cost.

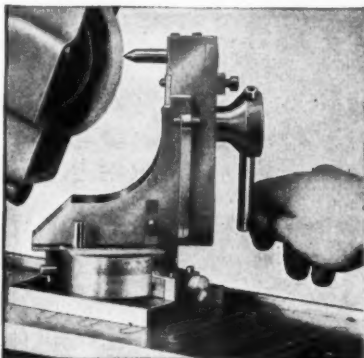
FEATURES

Fluid-motion dressing
.0001" accuracy
Automatic centering
14" wheel capacity
Large range yet compact
Chatterless and dustproof

J. & S. TOOL CO.

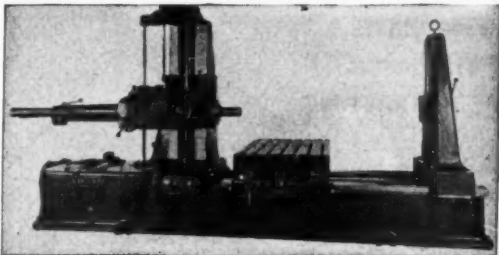
477 MAIN ST.

E. ORANGE 2, N. J.



P O R T A G E No. 4

HORIZONTAL BORING, DRILLING & MILLING MACHINE



● Designed and built to meet the need for speed and accuracy demanded of today's production.

WRITE TODAY

for fully illustrated bulletin giving detailed description of the many features of this Horizontal Boring, Drilling and Milling Machine. No obligation.

THE PORTAGE MACHINE CO.

AKRON 11, OHIO

ARO IMPACT WRENCH



A new $\frac{3}{4}$ " impact wrench that operates with controlled torque is announced by The Aro Equipment Corp., Bryan, Ohio.

This pneumatically powered tool, which the manufacturer says completely pre-

vents stretching or "burning" of threads, is capable of both forward and reverse rotation. It has a calibrated adjusting screw on side of motor that enables operator to set any bolt or nut to any desired tension.

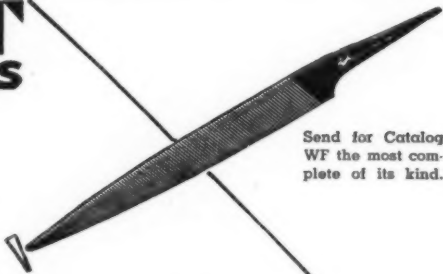
Control is obtained primarily thru construction of the roller clutch impacting mechanism. The roller clutch impacting mechanism consists of four major parts— anvil, hammer, and two cylindrical steel rollers. When in operation, centrifugal force throws the two steel rollers out against the hammer where they are caught in shear between hammer and anvil members. This transfers full torque thru to work in the form of a sudden impact.

When the selected torque is obtained, the rollers rebound from anvil face and do not allow hammer to engage for impact. The makers explain that this method of impacting prevents stretching of threads on stud or bolt and guarantees maximum torque. By the same token, in removing nuts or bolts, there is no "burning" of threads.

Model 131 has a capacity up to $\frac{3}{4}$ " bolt size, is only $6\frac{3}{4}$ " overall in length, and weighs $4\frac{1}{4}$ lbs. It comes complete with one socket and 8 feet of $5/16$ " hose and fittings.

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OVER 500 SHAPES
and SIZES FOR
EVERY PURPOSE



Send for Catalog
WF the most complete of its kind.

Genuine Grobet Precision Swiss Files
are world famous for utmost precision
and durability since 1812.

GROBET FILE CO. of AMERICA

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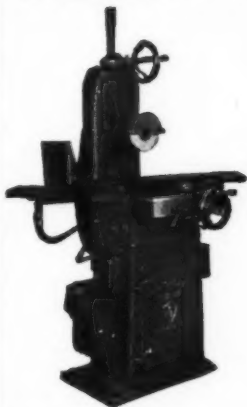


New York, ¹³N. Y.

IMPORTERS OF GROBET SWISS FILES

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SURFACE GRINDERS



Hydraulic Feed – Hand Feed

No. 2HFE Hand Feed 6½x24

No. 2AFE Hydraulic Feed 6½x24

No. 22 Hydraulic Feed 10x30

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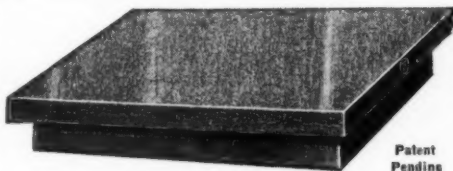
AMERICAN DRILL GRINDERS

...

LA SALLE TOOL CO.

77 W. Washington Street

CHICAGO, ILL.



Patent
Pending

TEST . . .

**HERMAN
PRECISION GRANITE
SURFACE PLATES**

**Right In Your
Own Plant**

A FEW FAMOUS USERS OF HERMAN GRANITE SURFACE PLATES . . .

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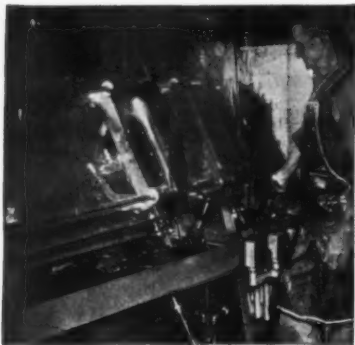
(Write for Comprehensive Re-
port by Internationally-Known
Technical Laboratory.)

Herman Precision Granite Surface Plates — test them under conditions as they actually exist in your own plant. **Herman Precision Granite Surface Plates** are positively accurate to 1/10,000 inch—cut from granite, they are hard and smooth—non-magnetic, non-porous, non-corrosive. Wherever precision requirements are highest, there you will find **Herman Precision Granite Surface Plates**. Available in many sizes at reasonable prices. Ask today for descriptive folder, technical data, and sample for test in your own plant.

The Herman Stone Co.

1238 Leonhard Street, Dayton 4, Ohio

COMPAR SPLASH CURTAINS



Splash curtains for protection of machine operators are one of the new uses for transparent sheets of compar—the flexible rubber-like synthetic developed by Resistoflex Corp., Belleville, N. J. This application was first tried out in a large electrical manufacturing plant in front of machines that threw oil, sub-

jecting operators to the dangers of oil-soaked clothing and necessitating continual cleaning of large areas surrounding machines. Large sheets of compar, a vinyl resin derivative that is entirely immune to oils and solvents, are mounted on frames and installed between operators and their machines. Since compar is completely transparent, performance of machines is visible at all times, and in addition, operators no longer run the chance of getting dermatitis from contact of oil with skin.

These splash curtains also are highly advantageous in testing departments where hydraulic fluids are carried under great pressure. Serious accidents are prevented in case of hose line breaks, because the tensile strength of compar protects workers from the impact of high-pressure fluid.

The flexibility of compar permits tailoring splash curtains to order for any type of machine, giving complete protection and, at the same time, complete visibility to the operator.

ALLIS-CHALMERS DIRECTORY

An attractive new 48-page directory of products and engineering literature "B-6057-B" has been issued by Allis-Chalmers


Accurately holds the depth at the same time it automatically centers parts for drilling, milling, tapping, etc. Needed in every plant where second operation work is done. Also for assembly or wherever a holding fixture to do precision operations is needed. Uses Brown and Sharpe type screw machine collets and simplifies "setting-up" operations and in most instances eliminates the making of jigs or fixtures.

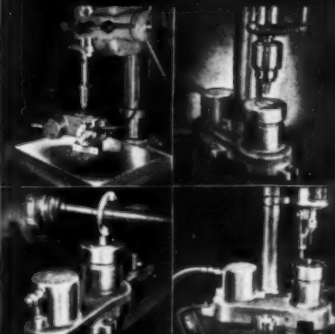
Has low consumption of air and its simplicity of construction eliminates expensive repairs.

Four models—No. 00—No. 0—No. 2 and No. 2 Special. Collet capacity from 1/16" to 1 3/4".

Literature on request.
Write for Catalog Sheet.







REDMER AIR DEVICES CORP.
408 W. WASHINGTON BLVD., CHICAGO 6, ILL.



TYPE B—STRAIGHT JAW DESIGN
Adapted for work with short and long bores.

Size No.	Range of Bores Taken	Net Price
1X	$\frac{1}{2}$ " to $\frac{1}{4}$ "	\$10.00
2X	$\frac{1}{4}$ " to $2\frac{1}{32}$ "	11.00
3X	$2\frac{1}{32}$ " to $\frac{3}{8}$ "	12.00
00	$\frac{3}{8}$ " to $\frac{7}{8}$ "	14.00
0	$\frac{7}{8}$ " to 1 "	16.00
1	1 " to $1\frac{1}{4}$ "	18.00
2	$1\frac{1}{4}$ " to $1\frac{1}{2}$ "	21.00
3	$1\frac{1}{2}$ " to 2 "	29.00
4	2 " to $2\frac{1}{2}$ "	40.00

TYPE A—STEP JAW DESIGN
Especially adapted for holding work with short bores while being machined between centers on lathes, grinders, millers, shapers, etc.

Size No.	Range of Bores Taken	Net Price
1A	$\frac{1}{2}$ " to 1 "	\$12.00
2A	1 " to $1\frac{1}{2}$ "	16.00
3A	$1\frac{1}{2}$ " to 2 "	23.00
4A	2 " to 3 "	34.00
5A	3 " to 4 "	40.00

NICHOLSON

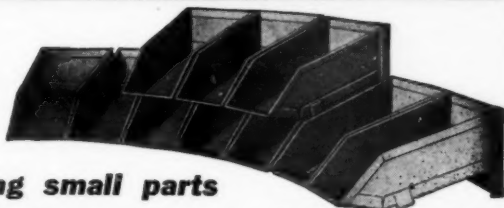
The Standard in
E - X - P - A - N - D - I - N - G
MANDRELS
the World around



Other sizes taking up to 7" bores. Hardened tool steel, accurately ground. Sold singly or in sets. Prompt delivery. Bulletin No. 1043.

W. H. NICHOLSON & CO., 117 Oregon St., Wilkes-Barre, Pa.

NEW BINS



for assembling small parts

Floors slope to feed parts to front — end reaching and fumbling.

All-welded construction. Rolled, smooth edges.

Bins taper toward front to form convenient semi-circle — keep all bins within easy reach.

Nesting, locking construction for rigid set-ups, easily changed when necessary.

Two sizes—tapered or straight edges. Hoppers available for steady work.

Write Stackbin Corporation, 85 Troy St., Providence, R. I., for further details and low prices.

STACKBIN



SYSTEM

"Stacked and

Still Accessible"

STACKBIN CORP., Providence, R. I.

Mfg. Co., Milwaukee, Wis. All of the A-C products are listed and briefly described. Engineering literature is included with reference numbers and there is a list of all A-C product trade names.

NEW SPIRAL ABRASIVE



Many shop people have become acquainted with the regular Spiral Wound Abrasive Strip that has helped speed-up the finishing of oil holes in hard-to-get-at areas.

A new development goes the Spiral Wound Strip one better. It is an Elek-Tro-Cut Three-M-ite Cloth Reinforced Spiral Wound Strip developed by Minnesota Mining & Mfg. Co., Saint Paul, Minn. The center is reinforced so you can bend it over, then reach down thru a center and thread it thru an oil hole or opening that has been causing a finishing problem. It is available in a wide range of grits, in diameters of 1/16" to 1/4" and in lengths of 4" and shorter up to 12".

Shop people who are responsible for getting finishing out on time and have some of these "pesky" problems, will be interested in learning more about these new reinforced spiral wound strips because they certainly go places and produce results where other forms of abrasives have failed.

SUBMERGED COMBUSTION

The Submerged Combustion Co. of America, Hammond, Ind., offers a booklet on an improved method of heating

NATIONWIDE



Service

Producto Die Sets and accessories can be assembled and forwarded to you quickly from five strategic points in the country, which you will find listed in the panel at the right. For information and service just phone your nearest Producto representative, as listed.

SPECIAL DIE SETS . . .

Quick service on all Special Die Sets and Bolster Plates from Bridgeport and Detroit.

Complete specifications
. . . No. 9 CATALOG



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PRODUCTO MACHINE COMPANY**

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The MASTER JEM

(A Complete Set-Up)

(Patent Pending)



Your Boring and internal threading jobs are made easy and accurate with this new, compact set-up.

The MASTER JEM block has positive lock jaw device (a new feature), reduces locking effort 75%.

Three gunsmith finish boring bars with 45 and 90 degree bit angle for $\frac{1}{4}$, $\frac{5}{16}$, and $\frac{3}{8}$ tool bits are included. Also one

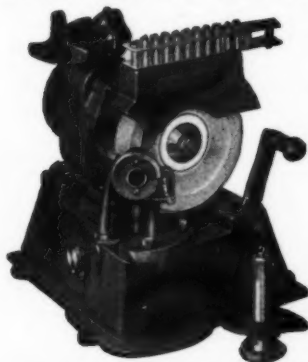
high speed forged threading tool for internal threading.

The two split reducing bushings included permit changing of bars within a few seconds. The MASTER JEM is adaptable to any size or make of lathe. Price, one complete set, packed in box, \$15.00 and up. Write for illustrated bulletin.

MEYER TOOL & ENGINEERING CO.,

Saginaw, Mich.

SMALL DRILLS ARE MIGHTY BIG FACTORS IN PRODUCTION OF WAR PRODUCTS—KEEP THEM SHARP AUTOMATICALLY—WITH



BLACK DIAMOND PRECISION DRILL GRINDERS

Motor driven, these highly efficient Black Diamond Grinders are doing yeoman service in hundreds of large and small war production plants throughout the nation.

They not only produce quantities of perfectly sharpened small gauge and fractional drills, with lips of uniform length, correct angle and proper clearance for true, accurate drilling—but release skilled mechanics for more important work.

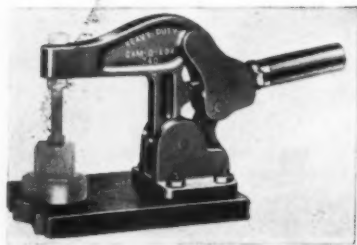
The Web thinner, an important attachment, cares for the proper grinding of Notched, Colton or so-called Crankshaft points . . . and the diamond dresser keeps the grinding wheel always sharp.

Write for Bulletin 122

BLACK DIAMOND SAW & MACHINE WORKS, INC.
NATICK, MASS.

and agitating pickling solutions and evaporating liquids. A diagram shows the principles of operation and illustrations show typical applications. Its use is claimed to result in lower heating, acid, and maintenance costs.

HEAVY DUTY VISE



The Jenkins Bar-Lok is the trade name for a fast locking, heavy duty vise of radically new design, developed by Mechanics Engineering Co., Jackson, Mich.

The vise is set and released by means of a Bar-Lok push-pull pressure unit. This has a positive locking contact at four

points and will develop pressure up to 20,000 pounds. The slow, old fashioned winding operation, common to threaded bars is eliminated, resulting in the saving of time in service. Only a quarter turn of the handle is needed to lock and release.

The Bar-Lok Vise is precision built for heavy duty, especially around milling machines and drill presses and wherever severe vibration might affect holding. The vise is built in one size. The 4" opening is said to be equivalent to any ordinary 6" vise. It is only 3½" high, with jaws 1½"x4¼".

PRODUCTION REAMING TOOLS

An unusually attractive 28-page bulletin presents the various types of adjustable reamers and boring bars made by Madison Mfg. Co., Wolf & Spring Sts., Muskegon, Mich. Engineered for hard metals, soft metals and plastics, the Madison line includes cutters and bars for every type of job. A number of special cutters are illustrated and listed as well as multiple cutters. There are numerous illustrations and descriptions of special applications of Madison cutters and bars. Detailed instructions are given on cutter grinding and specifications and price lists are included.

Speed Up LATHE PRODUCTION

with these
DIX-WILDER TOOLS

Here are two real production boosters for surprising increases in both output and accuracy.

MULTIPLE CARRIAGE STOP

• Increases efficiency of both skilled and unskilled workers—reduces scrap—increases output up to 100%—4 accurate indexed positions. For 9, 10, 12 inch lathes \$12.50; larger sizes in proportion.

AUTOMATIC COLLET CLOSER

• Fits lathes with ¾" spindle hole—accommodates 1-A collets. Positive locking; ball bearing adjustment; no sleeves—no pins—no liners; rust proof; quickly installed. Price \$50, complete.

Immediate delivery, AAS priority required on both.

Send for illustrated catalog.

DISTRIBUTORS TERRITORY JOBBERS
STILL OPEN



State size and
make of lathe.

DIX MANUFACTURING COMPANY
3447 EAST PICO BLVD. LOS ANGELES 23, CALIF.

**PRECISION
MADE
PRODUCTS**

No. 2 To No. 6

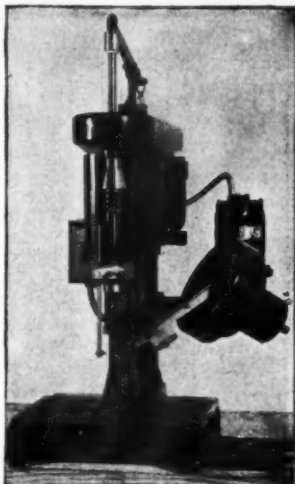
Screws Driven on this Husky but Sensitive Hopper Feed Screw-driver.

No handling of screws. Just place assembly on table, move from screw hole to screw hole. The machine does the rest.

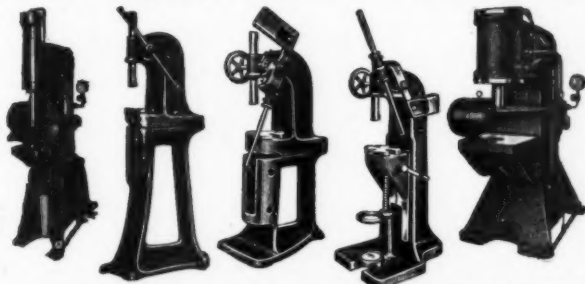
Drives screws at one second each.

DETROIT POWER SCREWDRIVER CO.

2809 West Fort St., Detroit 16, Mich.



For AIRCRAFT and MUNITIONS



**1883
GREENERD**

The Originators
of the
Arbor Press

1944

PRECISION WORK IN MANUFACTURING

65 Standard Styles and Sizes. Manually operated presses $\frac{1}{4}$ to 35 tons pressure. Motor driven hydraulic presses $1\frac{1}{2}$ to 30 tons pressure.

Let us send you our catalog No. F.

GREENERD ARBOR PRESSES

NASHUA

Est. 1883

NEW HAMPSHIRE

Trends ON THE PRODUCTION FRONT

CUTTER DEVELOPMENT

EVER since the invention of the milling machine by Eli Whitney in 1818, and particularly since the development of its universal feature, the problem of making available the proper cutters and tools for this versatile process has attracted the inventiveness of the best tool designers in the U. S.

The relatively new technique of negative angles for the machining of steel, according to the milling procedure, has started a new wave of experimentation and development along this fascinating line. The cutters described in this brief resume are examples of recent presentations to the trade and will serve to illustrate what is considered as a significant trend in tool and cutter design.

This discussion will be followed by a complete set of operating data for each of the three cutters presented in this issue. The material, to be presented subsequently, is the result of extended tests that may be of value and interest.

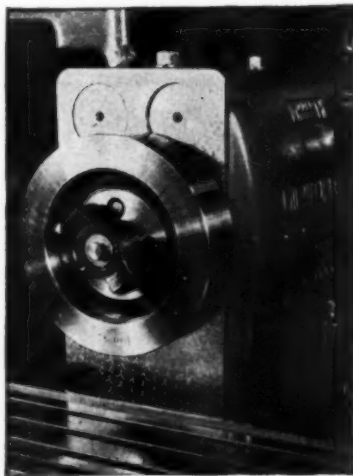
Weddell Tri-Bit Cutter

The Weddell Tri-Bit cutter, is a good example of ingenious cutter design. The sturdy tool holder or body serves as a holder for a bit of triangular cross section, giving maximum strength for a minimum of material. This bit is firmly and securely held in position by locking or set screws that at the same time make for easy and quick adjustment, replacement or re-conditioning.

Single point tools, of which this cutter is an excellent example, simplify the grinding problem and technique, so important in milling.

Multi-tooth cutters generally, demand

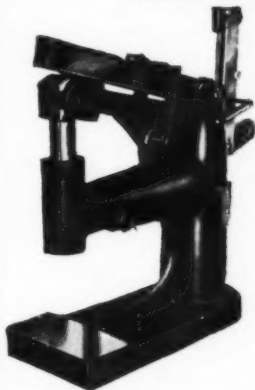
the utmost in skill of grinding, sharpening and reconditioning. The metal removing possibilities with present-day machine tool equipment require sturdy tools, accurately ground and sharpened. Unless accuracy of a somewhat unusual degree is worked into cutter grinding, the effectiveness of the milling procedure is not only lessened but the results are im-



Weddell Tri-Bit Flywheel Arbor

paired. Tolerances and finish are below par, frequently justifying rejection in final inspection, and thus production economy is lowered. But single point tools, for which there are innumerable application possibilities, make unneces-

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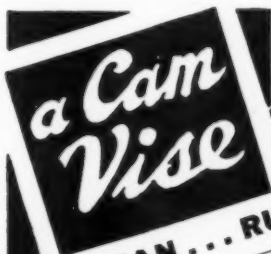
	1	1-B	2
Stroke	2"	2"	2 1/2"
Spindle	1"	1"	1 1/4"
Throat Depth	4 3/4"	4 3/4"	8 1/2"

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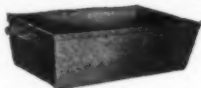
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sary such accuracy in grinding and re-conditioning. The Weddell Tri-Bit cutter has, therefore, this initial advantage that comes from its single-point design and, in addition, has the sturdiness necessary for current practice in which large horsepower operations are the rule rather than the exception.

The Kennamill

The Kennamill is a multi-toothed fly cutter, or what someone has referred to as an educated fly cutter. Its blades, three or four in number, depending on the diameter, are set at different levels or steps, and correspondingly, in different circles. This feature of the design of a step mill is, obviously, necessary if the tool is to be effective. Unless each blade is set in its own cutting circle, the high blade (that is, the blade set for the greatest depth of cut, will perform alone without benefit of the other bits or blades. But when these are set, not only at different depths but in correspondingly smaller circles (the shallowest bit set in the largest diameter circle and the deepest in the smallest) each tooth does its share of the cutting on its own level or step.



Thus it is possible to divide a depth of .150" into three steps of .050" each. Or, these depth settings may be varied. For example, if the last step is to be made a finish cut, let us say of .030", with the total overall depth of cut as .150", then

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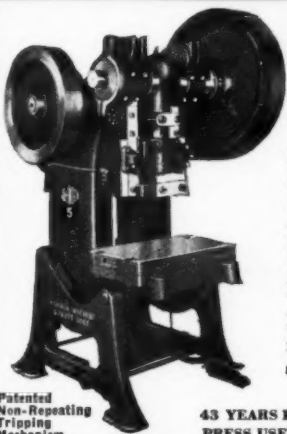
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JOHNSON MACHINE AND PRESS CORP., ELKHART, INDIANA

the divisions can be made thus:—the last step of .030" leaves .120" to be divided among the other two or three remaining steps.

There are several advantages of this ingenious cutter:—(1)—the important fact that in spite of its multi-toothed character, the individual blades or bits can be separately ground, off hand, on a pedestal grinder. This eliminates fussy grinding in a face mill or universal grinder which requires skill and careful technique.

(2)—This design removes the prime objection to the fly cutter, namely, the exaggerated interruptedness of its cut which in milling, particularly with carbide on steel, is a serious handicap to good or at least economical cutter life. The cutter, from this angle, operates much like any multi-toothed cutter, which with reasonable tooth pitch dampens some of the impact effect of teeth entering and leaving the workpiece.

Finally, the step mill can be set as indicated, for both roughing and finishing in the same setting. How this setting can be accomplished quickly and easily, using the dial graduations on the vertical movement of the table, will be explained subsequently. Thus, two results can be achieved in a single setting and one operation of this type of cutter.

Shearcut Milling Cutter

Probably the most radical of all the recent innovations in the milling of iron and steel is the so-called Shearcut, lifetime principle. A cutter used in this technique is shown. From this it is obvious that the rotor head carries an entirely different kind of cutting blade or

bit. The blades in reality are cups or concave discs of cutting steel, bolted to the rotor head. In the cutting process, revolution of the head carries the concave cup into the workpiece which is being fed into the cutter in the customary manner. It is claimed for this tool that a curled chip like that coming from a lathe is generated.

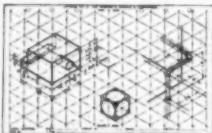


When the cutting edge is dulled, it is necessary only to loosen the nut fastening the cup to the rotor head, revolving the cup a fraction of a turn whereby a new and sharp cutting edge is presented to the workpiece. Thus from 10 to 30 cutting edges are available before the disc requires re-grinding.

Re-grinding is a comparatively simple matter. No special technique is required, no special skill, and according to the claims, a very small amount of time is needed for the re-conditioning process. Both the results of the cutting process, as well as the re-grinding of this unique cutter will be presented in a subsequent discussion.

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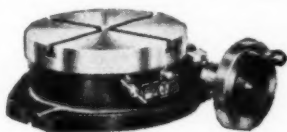
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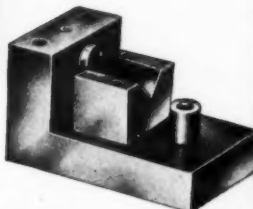
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Below, the conventional type cutting tool is illustrated bearing the metal, showing the slicing, knife-like action of Shearcutter Boring Tool.

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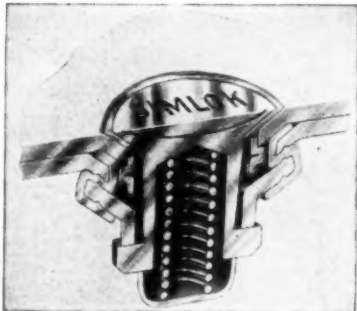
UNITED INDUSTRIES
15830 Livernois Detroit 21, Mich.

SIMLOK IMPROVEMENTS

The Simlok Division, Simmons Machine Tool Corp., Albany, N. Y., announces design and construction improvements in its Simlok fasteners for cowlings and panels. A revolutionary improvement over the old laborious and fumbling operation of screwing and unscrewing bolts, the Simlok fastener fastens or unfastens with a quick quarter-turn. Illustration shows it in the locked position.

When unfastened, the stud is self-ejecting, so it can be noticed easily. One quick inspection determines whether or not all fastening operations have been completed, those unfastened being distinguished easily because of the self-ejecting studs.

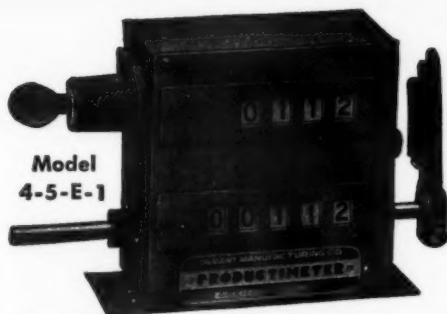
Three sizes and three types of studs—flush head, oval head and wing head are available.



Tapered design of fastener makes it particularly valuable in assembling curved sheets such as engine cowlings, actually forcing assembly into proper alignment before it can be locked. The Simlok completely eliminates side play and holds end play or spring deflection to a maximum of .008", or just enough to lock the fastener.

Simlok is constructed with a hollow inner one piece housing which is integral with locking lugs. It is case-hardened to eliminate wear. Inside is a long-travel helical spring which ejects the fastener when unlocked. An outer housing retains spring and inner housing as a complete assembly. A locking ring makes possible permanent installation where desired.

To lock, the two sheets are brought together so stud enters receptacle. Then stud is depressed against spring action and turned until it rides under the cam surfaces. It locks in a seat in the cam.



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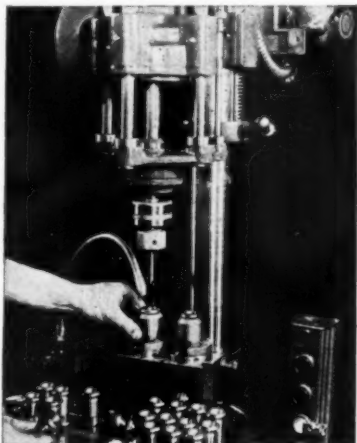
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Use of manual positioning and elimination of chucks or clamps on a simple, new non-locking slide type fixture has speeded up precision tapping of Ordnance parts at Manufacturers' Machine Service Co., Detroit. This fixture, incorporated by Manufacturers' Service on a "Detroit" light duty lead screw tapping machine, now permits tapping on a continuous basis and at the same time has reduced rejects.

The part required tapping of a $\frac{3}{4}$ "-16NF thread $1\frac{1}{4}$ " deep in a blind hole

in 1112 steel for a Class 3 mating fit. Originally the operation was performed by the conventional manually operated chuck and hand feed method requiring operator to load chuck, lock it, start tap, apply manual lead pressure, reverse tap, stop it, unlock chuck and unload chuck.



While relatively satisfactory in limited production it was decided to change the process to one providing more consistent thread form accuracy when production schedules were increased. At the same time, it was felt desirable to provide equipment which would avoid the necessity of duplicating of machines and operators to meet the new schedules.

To permit use of unskilled labor it was first thought that a completely automatic process capable of high production

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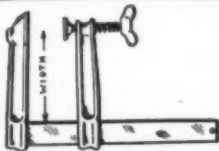


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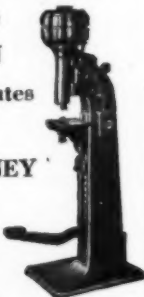
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rates was necessary. To meet accuracy requirements, a lead-screw type of light duty tapping machine produced by Detroit Tap & Tool Co., was selected.

A simple slide fixture was built in the company's tool room for holding and positioning work. This was arranged to operate on an automatic tap and return stroke cycle stopping at top. Fixture incorporated two non-locking work holders mounted on a slide that can be moved 'right' or 'left' on ground ways below tap. Adjustable stops for slide provide for correct longitudinal positioning of work under tap. Ground ways for slide, in turn, are supported between vertical arms of a U-shaped frame. This frame is bolted to T-slots on machine platen, making it adjustable at right angles to slide movement. With these adjustments, work in either work holder will be accurately located below tap when slide is moved from one side to the other against stops.

All operator has to do is to remove a finished piece and place a new piece in same work holder while the other piece is being tapped. He then moves slide over as soon as tap clears finished piece in the other work holder. A micro-switch was provided to start tapping stroke as soon as, and only when work holder was 'centered' beneath tap. However, its use was found unnecessary, since locating work correctly required no skill or time. A slight pressure of operator's hand to maintain slide against stop was sufficient to insure accurate centering of work. Actually this proved to be the most restful position for operator's hand after it had moved slide over, since only one hand was needed to remove finished piece and reload. With this arrangement it was possible to operate machine on a 'continuous repeat' cycle, reducing floor-to-floor time to less than 10 seconds per piece. It thus speeded up production by actually making the operation less automatic.

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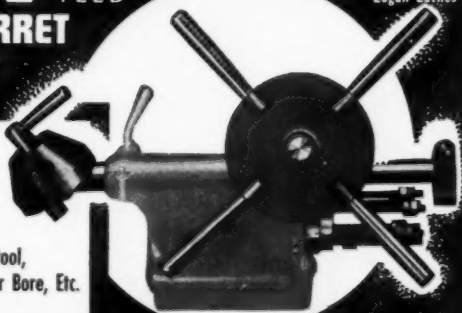


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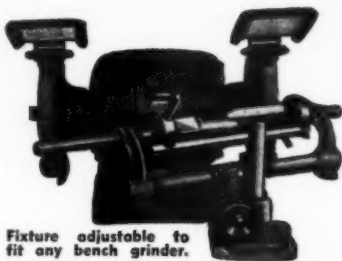
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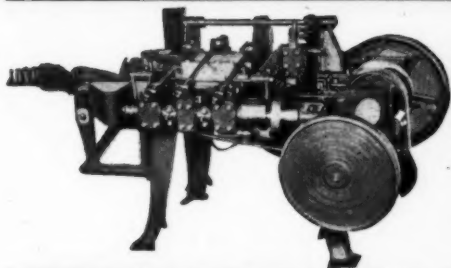
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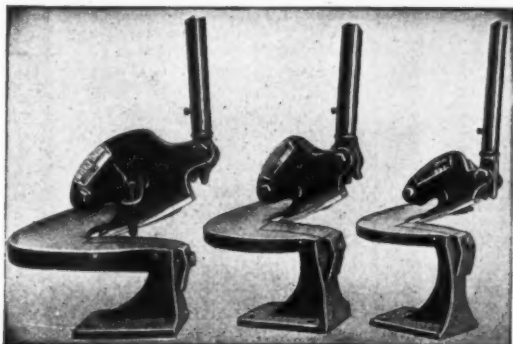


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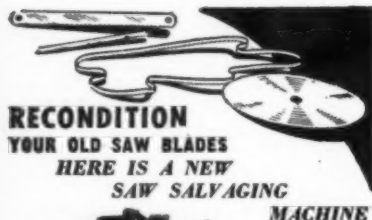
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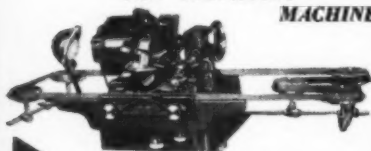
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THE HOWE-LINDSEY AUTOMATIC
SAW SHARPENER

Save... Time . Money and
Critical Materials

HOWE AND SON, INC.

HINSDALE, N. H.

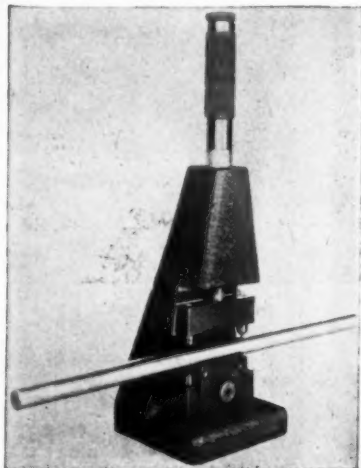
An electric etching attachment also is available. This attachment is valuable as a quick means of marking tools, templates, parts, etc. It is clamped to one of the welding jaws and marking is done with an etching pencil provided.

Complete specifications and illustrated literature are available from the DoAll International Co., 1300 Washington Ave. So., Minneapolis 4, Minn.

GAGE POINT PUNCH

Baldwin Locomotive Works, Eddystone, Pa., has developed a double-acting gage point punch on which impact force is adjustable for different materials. It is offered to the metals field for four reasons:—(1) it marks four uniform centers on specimen with one push of handle; (2) it automatically centers either round or flat specimens; (3) impact force is applied manually by an adjustable detent which eliminates use of a hammer; (4) impact and size of punch marks is adjustable to suit soft and hard specimens.

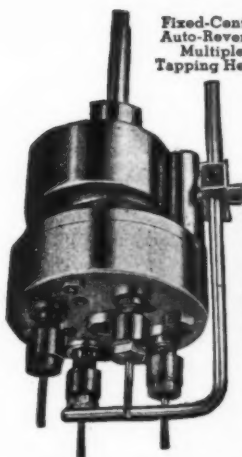
Upper punch holder, guided in a heavy frame, is attached to impact-adjustable handle. Entire upper punch point assembly is spring supported to keep gap between punch points open for largest specimen. When specimen is placed on support, upper handle is pushed down until all punch points rest on specimen. A continued push downward on handle brings to a pre-adjusted compression, a second spring within tubular knurled handle, releasing potential energy to produce impact on specimen.



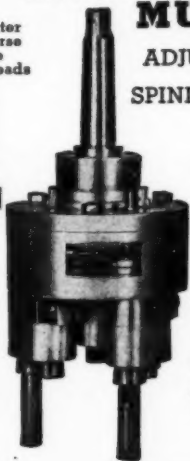
ERRINGTON MECHANICAL LABORATORY
STAPLETON, STATEN ISLAND 4, N. Y.
 6701 N. SIOUX AVE., CHICAGO

MULTIPLE HEADS

**ADJUSTABLE MULTIPLE
 SPINDLE DRILLING HEAD**



Fixed-Center
 Auto-Reverse
 Multiple
 Tapping Heads



All Parts
 Fully
 Enclosed
 to Insure
 Pressure
 Lubrication
 and
 Rigid
 Support of
 Adjustable
 Spindles



Super-Sensitive
 Fixed-Center
 Multiple
 Drilling Heads

MODEL No. 16 "SPECIAL"

**CONSTRUCTED AS PER SPECIFICATIONS OF U. S.
 NAVAL AIRCRAFT FACTORIES**

**BUTTERFLY FILING and
 SAWING MACHINE**

(Die Making Machine)

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10" Table; Model E.L. 12" Table.

HARVEY MFG. CORP.

161 GRAND ST., NEW YORK

Phone CAnal 6-5170



**BEWARE OF
 IMITATIONS!**

Our machine
 carries the Butterfly
 trade mark.

Registered U. S. Patent Office

CAST-TO-SHAPE STEELS

A beautiful new 16-page catalog has been issued by Jessop Steel Co., Washington Pa., illustrating how Cast-To-Shape steel is made.

Illustrations of a number of different typical shapers are given. The advantages of using Cast-To-Shape forms includes savings of time, labor, material and machining costs.

Cast-To-Shape steels are adaptable for forming, blanking, coining, and embossing dies; rotary shears; steaming, spinning, and automobile rim rolls, and many

other uses. Also used extensively in manufacturing of gauges such as thread, plug, ring and snap gauges, lathe centers and mandrels. A new type of Cast-To-Shape steel has been developed for molds, plungers, valves and rings in the glass industry.

"THE FIRST 25 YEARS"

An unusually handsome brochure has been issued to commemorate Ex-Cell-O's Silver Jubilee. In pictures and story, the history of the Company is presented, the officers are introduced, and many exceedingly interesting plant close-up views are included. Copies are available from Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.

MOGUL NERVOUS WELD BULLETIN

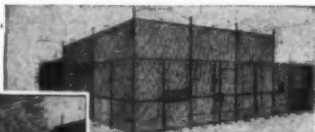
A new 4-page bulletin gives complete information on the new Mogul Nervous Weld Process which affords a positive method of salvaging defective aluminum castings. Bronze, grey iron, malleable and steel castings can also be effectively reclaimed by this process. Contains description of New Mogul Nervous Weld Pistol and Machine, also prices for complete installation. In addition, other time and money saving applications possible with this remarkable new unit are described, including such important uses as plugging holes, building up shrinkage fissures, changing contours on moulds and building up dimensional surfaces on parts that have not cleared up properly. Write Metallizing Co., of America, 1330 West Congress St., Chicago, Ill.

INDUSTRIAL COUPLINGS

An unusually attractive multi-colored leaflet presents the line of Flexoid Industrial couplings made by Flexoid Coupling Co., Division, The Smith Power Transmission Co., 1545 E. 23rd St., Cleveland, 14, Ohio. Several illustrations of typical applications of the couplings, specifications and prices are included.

Acme

WIRE MESH BARRIERS FOR TOOL CRIBS



Window Guards
SEND FOR
CATALOG

Stop sabotage—protect your factory and war production with Acme Wire Mesh Barriers. That's the most effective way of safeguarding tools, parts and critical materials, preventing loss, theft and malicious tampering. Acme Barriers provide

- Minimum interference with ventilation.
- Protection with minimum obstruction.
- Creates no fire hazard.
- Maximum economy in use of critical materials.
- Facility of rearrangement to meet changing conditions.

Acme

WIRE & IRON WORKS

CANFIELD & MORAN STS., DETROIT 7, MICH.

THIS IS OUR FORTY-FIFTH YEAR

Another Coupling IMPROVEMENT by Lovejoy!

L-R
FLEXIBLE
COUPLINGS

Non-Lubricated

New TYPE "C" Shrouded Coupling

NEW DESIGN with extension of outside steel collar over boltheads safeguard material and fingers. Send for complete L-R Catalog or L-R Couplings every service. Insure full noiseless power-flow.

LOVEJOY FLEXIBLE COUPLING CO.
5026 W. Lake St., Chicago 44, Ill.



Heavy Duty
Pat. & Pats. Pend.

THE
New

DEARBORN MODEL "B"

CHUCKING and INDEXING FIXTURE

FOR USE ON MILLING MACHINES

The Dearborn Fixture meets the demand for automatic chucking and indexing, permitting several operations on the same piece with only one setting. Its simplicity of design, high precision, milling accuracy and speed of operation has led to its adoption by many of the leading manufacturers thru-out the country.



Work held by automatically opening and closing collets. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces.

Write for
Folder

J. W. DEARBORN

**ANSONIA,
CONN., U. S. A.**

DESMOND GRINDING WHEEL DRESSERS



Desmond Hex Dresser



Desmond Heavy-Duty Dresser



Desmond Huntington Dressers

Our Desmond
Huntington
Cutters are
made in all
sizes.



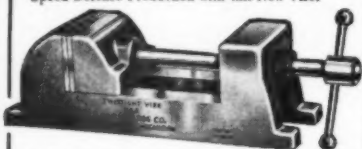
We manufacture only complete line of dressers and cutters on the market, and will be glad to send samples for trial. Write for copy of our new catalog and name of your nearest jobber.



THE DESMOND-STEPHAN MFG. CO.
URBANA • OHIO

DOUBLE YOUR DRILL PRESS CAPACITY

Minutes are Seconds with the new TWISTITE Vise.
Opens to full capacity in one second.
Speed Defense Production with this New Vise.



J. A. Richards Co., Kalamazoo, Mich.

CUB

VARIABLE SPEED TRANSMISSION

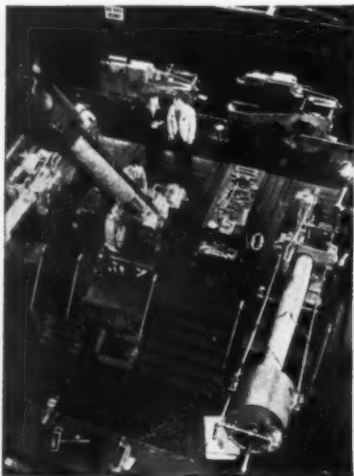


For "A" section V-belts—3.3—1 speed range—perfect belt alignment in all positions. Priced so low that no shop or machine need go without infinite speed selection. See your dealer or write \$16.50 (3 Types—8 sizes to choose from)

Standard Transmission Equipment Co.

3409 VERDUGO ROAD

LOS ANGELES, CALIF.



INDOOR "FIRING" TESTS GUNS—

There's no roar or flash of flame when these 5" guns are "fired" at the U. S. Naval Ordnance Plant operated by Westinghouse Electric & Mfg. Co.—but for testing purposes the results are much better. With the aid of a barrel-like device fitted over muzzle of gun, naval inspectors get a bird's-eye view of the recoil action, watching performance of various parts in relation to each other. On the actual firing range, this action would be far too fast to be observed. In this "kick test" a piston in the cylinder pushes the gun barrel back into full recoil position, then allows it to return to normal, giving the inspector just enough time to see how the loading and firing mechanism works.

LOW TEMPERATURE BRAZING

Low Temperature Brazing News, No. 27 issued by Handy & Harman, 82 Fulton St., New York 7, N. Y. covers the use of Sil-Fos, Easy-Flo and Easy-Flo No. 3 thruout the Marine Field. Illustrations show a number of representative examples of marine metal-joining operations. The low working temperatures and free-flowing properties of these joining mediums result in increased production and lowered costs.

Cut Clamping Time 50%—OR MORE!



Cardinal SPEED VISE
Opens and closes full range instantly. Locks and unlocks with half turn.
Cardinal Automatic AIR VISE
Synchronizes vise opening and closing with machine tool cycle—completely automatic.

WRITE FOR BULLETIN 3

CARDINAL MACHINE COMPANY

GREENSBORO

NC 27409



WADE ENVELOPES

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Shop Orders, Drawings, Blueprints, etc.

Made in three styles, transparent, fibre, and metal backs. Non-inflammable acetate windows. Special style or size to order. Write for details.

WADE INSTRUMENT COMPANY

Phone: CEDAR 4726

1422 E. 109th St., Dept. H, Cleveland, Ohio

A USEFUL ADDITION

Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight 1200 lbs.

We also manufacture angles and parallels as shown underneath surface plate.

We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. *Write today for full information.*



J. C. BUSCH COMPANY

165 SO. BARCLAY ST.,

ENGINEERS AND MACHINISTS
SINCE 1907

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THE HEINRICH HEAVY-DUTY HANDNIB

A Hand Operated Combination Nibbling, Shearing, Punching and Rod Cutting Machine. (With swivel base)

Capacity: Nibbling and Shearing 3/16" flat stock . . .
Punching Holes up to 1/2" in 1/4" sheets . . . Rod
Cutting 3/16", 1/4", 5/16" and 3/8" round
bars. Ask for Descriptive Folder.



THE NATIONAL MACHINE TOOL CO.

1536 CLARK STREET

RACINE, WISCONSIN



ARMOR COLLET CHUCK

Can't Slip • Accurate
No Lubrication • Runs Cool
Full Spindle Capacity
Collects in Stock • Prompt
Delivery.

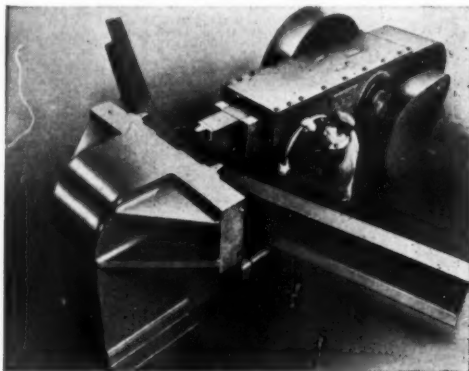
AIRCRAFT MACHINERY CORPORATION

214 West Orange Grove
Burbank, California

THOMAS BENDING MACHINES

A new line of Bending and Straightening Machines, in six sizes having capacities ranging from 50 to 400 tons for cold bending and straightening structural shapes and other metal forms, has been announced by Thomas Machine Mfg. Co., Pittsburgh, Pa. They are fully described in a new Bulletin No. 315.

A 15" beam being bent in one of the new Bending and Straightening Machines made by Thomas Machine Mfg. Co., Pittsburgh (23) Pa. The new line comprises six sizes with capacities ranging from 50 to 400 tons, for cold bending and straightening, and handling 5" to 24" beams.



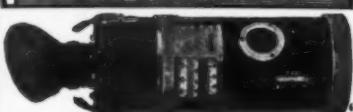
Beams, channels, rails, shaftings, rounds, squares, forgings, structural sections, or any metal sections that require bending or straightening can be handled by the machines. Weighing from 3,800 to 55,000 lbs., the machines can bend and straighten 5" to 24" beams.

The machine eliminates the wasteful process of heating beams or shapes, stacking them out on a bending table, and having work gangs hammer them to the desired shape. Since work is performed cold, no furnace is required and one man easily handles the operation.

Modernized thru-out, with important mechanical improvements, welded steel frame, and entirely enclosed operating machinery, the new line replaces previous Thomas' bending and straightening equipment.

A continuously running ram with one bending block, striking against the shape to be bent midway between two bearing blocks, represents the operating principle of the machines. Length of stroke of the

PYRO THE SIMPLIFIED OPTICAL PYROMETER



Unique construction enables operators to rapidly determine temperature even on minute spots, fast moving objects or the smallest streams; no correction charts, no accessories, no upkeep.

THE PYROMETER INSTRUMENT CO.
102-105 Lafayette St., New York, N. Y.

ram is quickly adjustable by a convenient hand-wheel so located operator has unobstructed view of his work.

Free running table rollers, with anti-friction bearings, support material being passed thru machine.

Other construction details include fly-wheel, in anti-friction bearings, located within the frame for safety and to eliminate overhead load on bearings; V-belt drive providing quiet operation and reducing shock load on motor; cast steel gears and steel pinions, all having cut teeth, with gear covers provided; high carbon steel forging cam shaft.

THE UNDER-STRUCTURE IS IMPORTANT TOO!

**Smith *Master* Surface Plates are built
to HOLD THEIR PRECISION**

The deep elliptical ribbing, exclusive on all Smith plates, assures a maximum of rigidity, a minimum of deflection and long retention of accuracy.

Lapping and planer-finish plates also available. Many sizes in stock.

Write, wire or phone.

SMITH TOOL & ENGINEERING CO.

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Elliptical
Rib Construction
exclusive with Smith

Smith Master Surface
Plate and Stand

LEACH External Grinder

\$875.00

Fully Equipped

**Grinds work from $\frac{3}{4}$ " to
11" in length and from
 $\frac{1}{8}$ " to 7" in diameter.**

Our dealers will help you fill out necessary
priority forms. Write us today for your
nearest dealer's name and address.

**Send for Descriptive Literature
EXCELLENT DELIVERIES**

Exclusive Selling Agents

H. LEACH MACHINERY CO.

387 CHARLES ST.

PROVIDENCE, R. I.

Agents in all Principal Cities Throughout the World



POSTER FOR HAMMER-MEN — The old adage "Strike while the iron is hot" is given new emphasis in a poster prepared for forge shops by Chambersburg Engineering Company, Chambersburg, Pa., manufacturers of forging hammers. The poster is 20x30" in size, and is printed in bright, flat poster colors.



HEVI-DUTY BULLETINS

Two interesting new bulletins are offered by the Hevi Duty Electric Co., Milwaukee, Wis. Of these No. HD-744 covers Hevi-Duty Convection Tempering Furnaces which provide temperatures to 1300° F. These furnaces are designed particularly for the tempering of small work for production or the tool room, and for many low temperature laboratory applications. Full details and specifications are given.

Bulletin HD-644 is devoted to Hevi-Duty Car Bottom Furnaces. These furnaces have wide application in many industries for annealing, hardening, ageing, stress relieving, nitriding and other operations where heavy parts or a large volume of work must be heat treated at a temperature of 2000°F or below.

The many different arrangements of

furnaces of this type are discussed and a number of typical furnaces are illustrated.

ALL-PURPOSE SAWING MACHINE

The new DoAll Zephyr high speed friction cutting machine is described and illustrated in a new four-page bulletin being distributed by the manufacturers, Continental Machines, Inc., 1300 S. Washington Ave., Minneapolis 4, Minn.

It gives specifications and the high operating speeds of these new machines, showing their wide application in the shaping and fabricating of all materials such as light alloys, plastics, wood, rubber and sheet metal.

Pictures show the convenience of operation and safety factors of these machines as they shape sheet metal, aluminum castings, wood, plastics, sponge rubber, etc.

Distinguished military guests and outstanding business leaders were present when Sheffield Corp., presented Brigadier General H. F. Safford, representative of Major General L. H. Campbell, Jr., Chief of Ordnance, with a replica of the Precisionaire gage, typical of the instruments responsible for dimensional quality of millions of gun barrels. Left to right:—Louis Polk, President of Sheffield; S. C. Allyn, President of National Cash Register Co.; E. F. Johnson, Vice President of General Motors, Detroit; Brigadier General H. F. Safford; Brigadier General James Kirk; E. R. Godfrey, General Manager, Frigidaire Division.



FELLOWS SHAVING MACHINE FOR INTERNAL GEARS

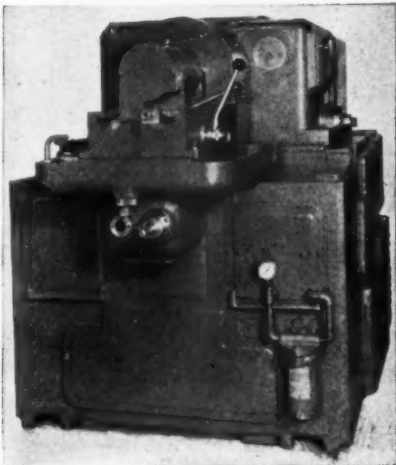
The Fellows Gear Shaper Co., Springfield, Vermont, has recently marketed a new machine for shaving internal spur and helical gears.

This machine operates on what is known as the "parallel axes" method, in that the shaving tool and work are held with their axes parallel to each other when the tool is operating.

A rotary type of shaving tool is employed. This is held on a rigidly mounted spindle which is reciprocated at comparatively high speed. The work is held in a fixture mounted on an adjustable knee, which is operated by a depth feed cam for bringing the work into contact with the tool under pressure.

The desired shaving action is obtained by proportioning the rotation of the tool and its reciprocation so that the tool "skids" on the tooth profile of the work, thus effecting the desired shearing action. In operation the tool is rotated in one direction to finish one side of the teeth, then reversed to finish the other side of the teeth. This reversal of direction of rotation, as well as the number of strokes for each direction, is accomplished automatically.

The shaving tool-spindle is reciprocated by a crank mechanism, and is controlled by a guide—a straight guide be-

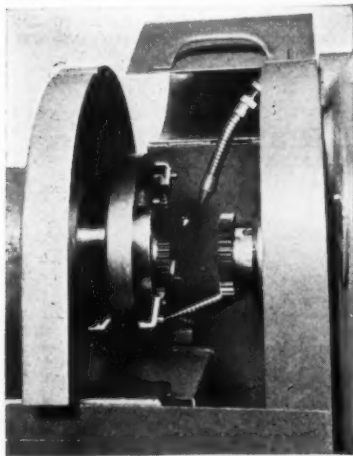


ing used when shaving spur gears and a helical guide for helical gears. The tool drives the work, and is reciprocated a comparatively short distance—approximately $\frac{1}{8}$ ".

The machine is provided with complete electrical control and is operated by push buttons. Maximum capacities are: diametral pitch, 6; face width up to 10 pitch $1\frac{3}{4}$ "; 12 to 16 pitch 1". Capacity for diameter is governed by the design of the work, fixture and size of shaving tool used.

WILLEY'S CARBIDE TOOLS

A handsome new 36-page catalog No. 27 has been issued by Willey's Carbide Tool Co., 1340 W. Vernor Highway, Detroit, 1, Mich. It includes a number of pictures showing different steps in the manufacture of Willey's metal, and helpful recommendations are given for the use of carbide tools. Many different types of tools are illustrated and specifications are given. Included are form tools, tipped shell reamers, core drills, milling cutters etc. Gaging equipment of Willey's metal is also presented along with extrusion and wire drawing dies, mandrels, tipped centers, masonry drills, support blades for centerless grinders, etc. The different models of Willey's Carbide Tool Grinders are also illustrated and described and several pages of helpful engineering tables are included.



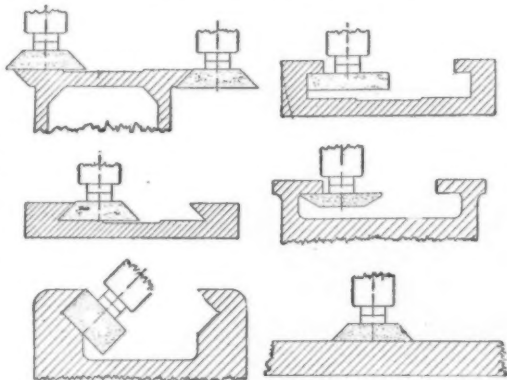
CARBIDE DRAW DIE



Indicative of the expanding use of carbides in larger sizes, particularly where wear resistance is important, this huge sheet metal die — manufactured at Carboloy Co.'s Detroit factory — contains enough Carboloy Cemented Carbide to make several thousand average sized tips for cutting tools.

The carbide nib weighs over 100 pounds. Used for more economical deep drawing of sheet steel compressed gas storage tanks, the completed hard carbide die nib, which is shrink fitted into a steel casing, has an I.D. of approximately $9\frac{1}{2}$ " and an O.D. of 13".

Types of work which can be handled on the new Mattison Precision Vertical Spindle Grinder, illustrated and described on page 294. (The engraver delivered this cut to the wrong address, but it was finally recovered at the last minute).



AUTOMATIC LATHE HANDBOOK

"How to Increase Production on Short-Run Turning with An Automatic Lathe" is the title of an attractive new 44-page booklet offered by the Sundstrand Machine Tool Co., 2535 Eleventh St., Rockford, Ill.

Processing gear blanks and turning and boring bushings are two of the 11 short-run jobs described in the form of case histories. Also shown, are nine widely different solutions to special lathe or high production jobs such as turning and grooving aircraft pistons, taper turning valve plugs, etc. Besides facts and data, each job is illustrated with photographs and tooling sketches. Additional information includes practical tips on processing work and how to set up the Sundstrand Automatic Lathe.

Every man interested in increasing production on turning operations will find valuable suggestions in this book. A free copy will be sent in answer to requests on a company letterhead. Ask for Bulletin LI.

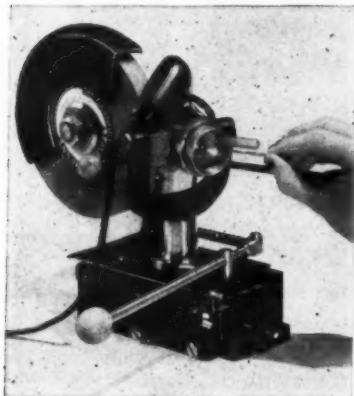
OIL RESISTANT STOCK

A new Buna N fuel resistant stock (233-5), which retains a tensile strength of over 1,000 pounds per square inch and elongation of over 100% after being subjected to aircraft engine oil at 300° F for a period of 70 hours, has been developed by Los Angeles Standard Rubber, Inc., 1500 East Gage Ave., Los Angeles.

This stock was designed for oil seals, oil rings and other applications requiring resistance to aromatic fuels. It also remains flexible at 40° F below zero and has a very low compression set.

SHARPENING SMALL DRILLS

Mercury Products Co., Cleveland, Ohio has designed and are manufacturing an attachment for sharpening small twist drills from No. 70 to 15/64". Their sharpener has no cams. Every rotating movement is on centers, automatically taken up by spring tension. It can be used with any standard 6" or smaller grinding wheel.



There are just four simple steps in operating. First, insert drill, tighten chuck. Second, look thru the magnifying glass and line up lip of drill on the alignment bar. Third, depress grinding bar slowly and release. Last, revolve the chuck and repeat the third operation. It is claimed an inexperienced operator can do a perfect job after a few minutes' instruction.

Every size drill requires a separate bushing, 10 of which are supplied with each drill sharpener. Extra ones are available at nominal cost.

For the duration, Tombill Drill Sharpener is available on priority only. Delivery is about five weeks. Descriptive literature may be had on request.

WELDING TIMER HEAT CONTROL

Suitable for welding small objects of high conductivity, such as aluminum or copper, a new precise welding timer with heat control for timing intervals of one-half cycle or less has been developed.

Precise, because welding current is made to start at the same point on the voltage wave for every operation, the new SP-18, 1/2 cycle timer is designed for welding of such items as radio tube parts and sockets, pig-tail resistors to terminal lugs, watch and instrument parts, contact tips on electrical relays, etc.

Timer is furnished as a separate control for use with existing small bench welders and also in combination with a small welding transformer. Only one control tube is used, this thyatron serving the dual purpose of rectifying a-c to charge a firing capacitor and also firing the small igniton power tube. Heat control is accomplished by a phase shift method, adjustment dial for which is mounted on cabinet door.

Further information on this timer rated at 230/460 volts, 50/60 cycles, may be obtained from Department 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

LOCK WASHER FOLDER

Reliance Spring Lock Washer Folder No. 142 has been released by the Eaton Mfg., Co., Reliance Division, Massillon, Ohio. It covers engineering data on all types of Spring Lock Washers. Contains compact general information and ready reference on steel section size, and I.D. and O.D. dimensions, for engineering, designing and purchasing of Reliance Spring Lock Washers.



McMAHON'S Magnetic Blocks

V-100 Magnetic Block

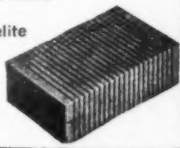
30-45-60° Angle, with Brass Separators, Brazed in place. Size 2 1/2" x 2 1/2" x 3 1/2" long. Priced \$35.00 each.

K-125 Magnetic Parallels

Sold in Sets of Two Blocks, with Bakelite Separators. Size, 1-3/32" x 2 1/4" x 4" long. Price, \$12.00 per Set.

Write for Descriptive Literature.

FRANK McMAHON COMPANY
142 S. JUNE ST. DAYTON 3, OHIO



MORE POWER LESS WEIGHT

GRINDS
MILLS
DEBURRS
ENGRAVES
POLISHES
FINISHES



$\frac{1}{8}$ H. P.
35,000 R. P. M.
Weights only
35 oz.

• Extra power and higher speeds for faster, smoother work on steel, non-ferrous metals, plastics, and most other materials. Speeds up to 35,000 r.p.m. under load reduce frictional wear on mounted wheels and cutters through lower operating pressure by as much as 50%.

STREAMLINED PLASTIC CASE

Practically indestructible case fits the hand and mounts in stand, vise, or lathe. *Guaranteed shockproof on AC or DC without ground wire.* For close jobs attach COOLFLEX Flexible Shaft which extends full power and speed to 9-oz. cool-running handpiece.

PRECISE PRODUCTS COMPANY
1331 CLARK ST. • RACINE, WIS.



THE PRECISE 35

HOLLOW MILLS

As might be expected, hollow mills have extensive use on automatic screw machines. Manufacturers of machines in the single spindle type, (such as the B & S screw machines) provide hollow mills to be used with them. Plain hollow mills may be had in both right and left hand styles, the right hand mills are provided if nothing is specified.

In ordering such mills, which are designed for rough turning, the turning size is specified, and the hollow mill furnished will cut somewhat oversize. This is done, because the plain hollow mill is essentially a roughing tool, and should

Send

FOR THIS HELPFUL
16-PAGE BOOKLET



be followed up with a finishing hollow mill, when an accurate job is desired.

The plain hollow mill is provided with three cutting teeth, fashioned from a solid blank which has been center drilled. This distributes the cut and divides it. It reduces chances for deflection of the work. The mills are made with undercut teeth for the milling of steel.

If a hollow mill is wanted for machining brass, the arrangement is different, and this should be specified when ordering. Any special size of hollow mill may be had to order.

However, there are some places where much hollow milling work is on hand, running to so many sizes that it is deemed better to have an adjustable hollow mill for all but the standard, most-used sizes.

The adjustable hollow mill is used in the turret of the screw machine, just like the plain type. However, the ad-

justable mill has three cutting blades, which can be adjusted to provide the desired diameter. There are different sizes of these mills, and each one has its own diameter range. When the blades for such a mill have worn out, they can be readily replaced.

Finishing type hollow mills are used in another position in the turret, for finishing the diameter that was left oversize by the roughing type mill, whether it was plain or adjustable. Finishing hollow mills are adjustable, as made by one firm, but they have only two inserted cutting blades. In addition, they have two back rests, to bear on finished surface diameter.

★ THE ★ WONDER CUTTER

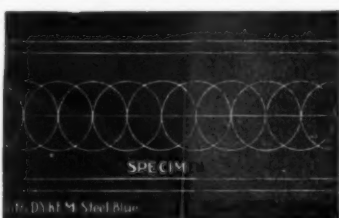
Small enough
to go in any
out - of - the -
way place
— yet it
cuts wire
and rods up to $\frac{5}{8}$ in. round ($\frac{3}{4}$ in.
square) and band iron up to
 $\frac{1}{2}$ in. by 2-in.

Adjustable stop for gauging the
length of pieces. Hardened cutters
that last indefinitely.

Get the "dope" on the lowest priced
cutter out—

THE WONDER

The Federal Foundry & Supply Co.
4602 East 71st St., Cleveland, Ohio



DYKEM STEEL BLUE STOPS LOSSES making dies & templates

Simply brush on, right at the bench; ready
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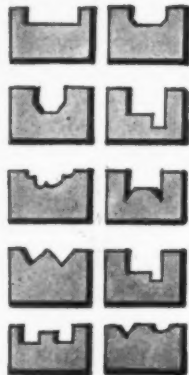
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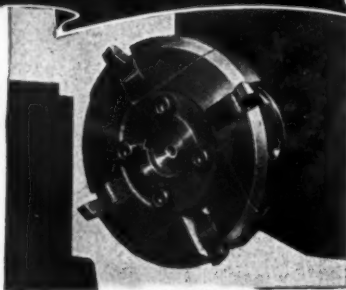
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SURPLUS PLANTS AND GOODS

An optimistic attitude toward postwar problems of disposing of government-owned surplus goods and war plants is expressed by the Committee for Economic Development, 285 Madison Ave., New York, 17, N. Y., in a recent statement on National Policy. Entitled "Postwar Employment and Liquidation of War Production," this statement deals with (1) disposal of government-owned surplus goods, (2) disposal of government-owned industrial plants and facilities, (3) termination of war contracts.

In sounding a note of optimism, CED

search studies sponsored by the CED Research Committee, of which Ralph E. Flanders is chairman.

"If the war should end tomorrow," CED estimates, government-owned surplus goods would probably not exceed \$60 billion. But from the point of view of business, the problem is far smaller than this sum would indicate. Three-quarters of the surplus stocks will be combat ordnance. Of the \$15 billion that is merchantable, fully half will be located abroad.

The remaining \$6 or \$7 billion, is equivalent to 2 months' normal retail sales

warns that "it will be idle to pretend that liquidation of war production is not one of the most complicated tasks the nation has had to face" Nevertheless, the magnitudes of these problems do not justify a defeatist attitude, if prompt and coordinated plans are prepared in advance for handling them.

The CED statement is presented both as an expression of the views of the business members of its Research Committee, and as a summary of the principal conclusions of a CED research study by Professor A.D.H. Kaplan, Dean of School of Business Administration, University of Denver, on leave.

Dr. Kaplan's book, has been published by the McGraw - Hill Book Co., under the title of "The Liquidation of War Production". It is the second in a series of re-



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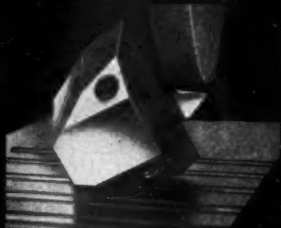
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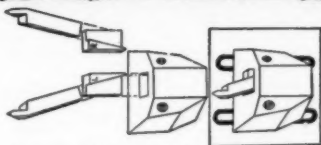
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A Standard Quality Manual, providing for the first time a uniform set of definitions covering the quality of aircraft parts and materials, has been prepared for all major West Coast airframe companies and their outside production sources.

Master inspectors, technical writers and illustrators from the seven Aircraft War Production Council companies compiled the 188-page manual because of the need for a uniform understanding of objectives in maintaining quality control

in war production.

The manual does not prescribe inspection procedures, which may vary between manufacturers, but endeavors to reduce each subject to the clearest and most concise language on which a large number of experienced inspectors can agree.

Its purpose is twofold—to enable all inspectors to work by a uniform set of rules, thus improving coordination between inspection and production departments, and to serve as a reference work in training inspectors.

In reducing the intricacies of the inspecting aircraft parts, materials and equipment to terms understandable by persons with limited technical training, the book makes extensive use of drawings, photographs and cartoons. Each operation is illustrated and described,

the proper method being shown in blue and the incorrect way in red.

Direct reference to specification numbers is purposely avoided, and no effort has been made to incorporate factory procedures. Since specific information on aircraft materials and processes is constantly being revised, inspectors must be familiar with current specifications.

The manual was compiled purely as a reference work, and is not used as an authority or to supersede existing governmental, commercial or prime contractor specifications.

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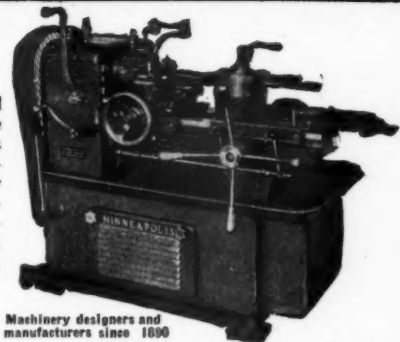


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CONTRACT TERMINATION

A new venture in business education began recently in Philadelphia with the opening of a contract settlement training program for war contractors and Government representatives at the University of Pennsylvania.

The Government representatives and the contractors will sit in the same classrooms and be trained together.

"The purpose of this training program," John M. Hancock, Chairman of the Joint Contract Termination Board explained, "is to speed settlement of terminated war contracts and in that way contribute to

swift reconversion by giving key representatives of the Government and industry intensive advance training in dealing with problems of contract settlement."

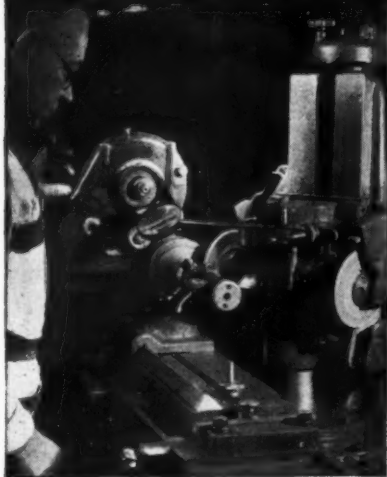
"The job of settling terminated war contracts is a double-barrelled one," Mr. Hancock pointed out. "Contractors must do their share along with the Government. Thousands of first rate accountants, auditors, lawyers, negotiators, engineers, and business executives will be required. In addition to their normal technical training, all of these persons will require special training in the particular problems of contract settlement."

"Training Government and industry men together should prove of mutual advantage," Mr. Hancock continued. "Industry will know what the Government expects of it. Government negotiators will gain from contact with men who know the realistic problems of industry firsthand."

The University of Pennsylvania project is to serve as a model for a nationwide training program which will use an estimated 50 colleges and universities in various parts of the country, Mr. Hancock said.

He indicated that this full training program would wait on action by Congress on legislation now pending for settlement of terminated war contracts, since the complete and final curriculum will depend on that legislation. (A bill has passed the Senate (S. 1718) and is now before the House.)

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VETERAN RE-EMPLOYMENT

A statement of major interest and importance to returning wounded men of the armed forces was made recently by A. V. Gruhn, General Manager of American Mutual Alliance, 919 N. Michigan Ave., Chicago 11, Ill. He announced distribution to employers of a guide to the adoption of special plans whereby disabled veterans may be employed with full efficiency and normal value to themselves and their employers.

The mutual casualty companies and their policyholders have from the beginning been anxious to expedite

and speed return of veterans and other disabled persons, particularly those handicapped by injuries received in the service of their country, to their proper places in our economic life.

Realizing that a resolve is not enough, they are supporting their resolution by positive action and are following a policy of close cooperation with their policyholders in this program of swift and effective rehabilitation and re-employment.

The guide is the product of the engineering and policyholders' service executives of the mutual group. It is in the form of a 22 page booklet which sets forth in detail, the steps to be followed in placement and subsequent supervision of returning veterans and others who have received permanent physical injuries.

It is the result of long consideration and careful

deliberation. It stresses the importance of the employer, at the time of re-employment, knowing of and evaluating the nature and the extent of the disablement resulting from injury sustained by the veteran.

It deals with the need for complete and thorough analysis of jobs and the fitting of the individual into the occupation best suited to him. Great emphasis is laid upon the importance of the proper introduction of the injured person to his new vocation and the considerate supervision of such person during the period of orientation.

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ENGLISH-CHINESE DICTIONARY

Recognizing the increasingly important part transportation will play in the industrial and cultural development of post-war China, the Marmon-Herrington Co., Indianapolis, Ind., builders of all-wheel-drive automotive vehicles, is making a substantial contribution to a better understanding between the Chinese and American peoples by underwriting preparation of an English-Chinese automotive dictionary.

Books of technical terminology are few in China. Until now, there has been little

standardization of Chinese automotive terms, and no organized translation of any great number of American names and terms into the Chinese language. The new book which consists of 252 pages, lists almost 10,000 automotive and related terms and phrases, with their Chinese equivalents.

It will prove particularly valuable to the military forces operating in China while the war continues, and to governmental and civilian transportation organizations in the reconstruction period when peace returns. At the same time it will serve the interests of the entire automotive industry of America and should be helpful in promoting an expanded automotive trade between China and the United States.

The new dictionary has been in course of preparation for over a year. The task

of research, compilation of names and terms and the translation into Chinese has been done by Calvin C. Chang, with cooperation of C. Alfred Campbell, Vice President of Marmon-Herrington Co.

After translation, the Chinese words and characters were inscribed by Mr. Chang by hand for photographic reproduction. The work represents many months of painstaking toil.

Mr. Chang is representative of the thousands of cultured, well-educated, forward-thinking young men of China who will play an important part in development of that country.

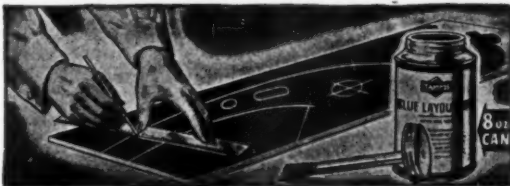
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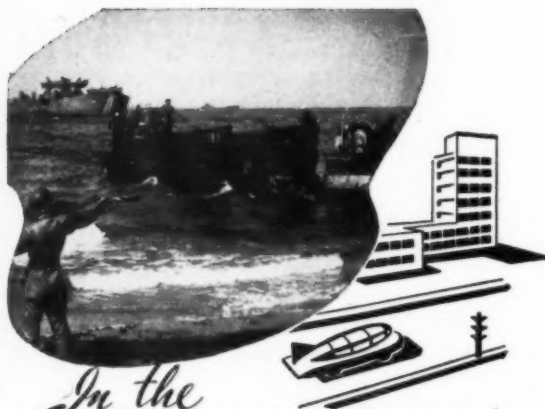
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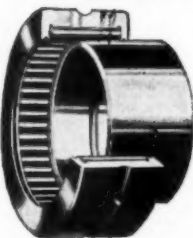


In the POST WAR WORLD

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RADIAL DRILLING MACHINES

Two general types of radial drilling machines are widely used. One of these has a sensitive drilling spindle, carried at the end of a so-called universal arm. This is an arm with an elbow joint in the center of its length. It can be manipulated to increase or decrease the radius of the arm swing, bringing the drill spindle to any desired position at once, over a hole layout area of considerable size. The other type is perhaps more widely known, and has an arm carrying drill head which can be elevated, lowered or swung on a center column, traversing the swinging arm to

bring it to any required radial distance from the column.

One radial drill of the universal-arm type has been observed which is provided with a round standard arising from the machine base to support the universal arm and drill head.

The machine base is T-slotted to provide a work-holding table in instances where the work is heavy and bulky.

An intermediate work-holding table is provided, and supported from the round standard by a sleeve. This table can be used for lighter work, or it can be loosened and swung around the standard out of the way when heavy work is to be handled on the lower base or table. The machine is fitted with a full floating, ball bearing spindle, and will drill to the center of a 36" circle.

A more highly-developed drill of this kind is provided with a four-foot swing, and has a

sensitive spindle at the end of the universal arm, which is geared for six speed changes. This machine also incorporates a tapping mechanism, which can be used on a wide range of hole sizes up to one inch in diameter.

Drilling, reaming, tapping and spotfacing are all operations that can be performed on large radials having drill heads traversing swinging arms. Such machines are made by a number of different firms, and are widely used. The ease with which some of these modern machines are controlled is something at which to marvel, as they perform their jobs.



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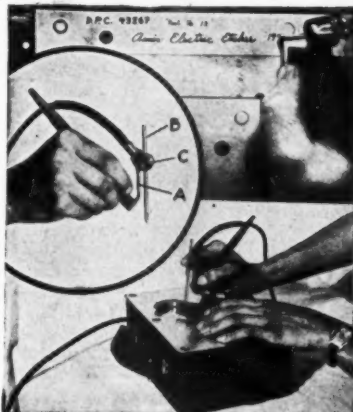
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MACHINE TOOLS AND METHODS
FOR TOMORROW'S PRODUCTION

BENDING AND FORMING

The principle of bending plate with rolls is very interesting. Three rolls are arranged in parallel, two of them making contact with one side of the plate passing thru, and the third one making contact with the other side. The third roll is located on a line halfway between the other two, and therefore makes contact with its side of the plate at a point midway between the other two. This third roll is adjustable toward and from the others, so that the plate can be forced progressively out of a true plane in its travel, and by that means is uniformly

bent. In other words, the radius to which the material is bent, answers to the adjustment of the third roll. The closer it is moved toward the others, the shorter is the radius obtained on the material being rolled.

On some kinds of work, horizontal rolls are to be preferred, while on other kinds, and especially on very heavy material, vertical bending rolls are employed.

There is one firm which makes horizontal bending rolls, in capacities for handling steel from $\frac{1}{8}$ " up to and including $\frac{3}{4}$ ". These rolls may be had in lengths up to 16 feet, to handle material of that length, and they have been found excellent for all kinds of tank, boiler and other cylindrical work within the limits mentioned.

One company which makes both horizontal and vertical bending rolls has at times produced some remarkable equipment along this

line. One very high capacity vertical bending roll was built for bending the plate to make 30-foot diameter conduits for the penstocks of the Hoover dam. The plate bent to make this conduit was almost 3" thick. The power necessary, and the rigidity that must be incorporated into bending rolls for a job of this nature, can be imagined.

Various types of special forming is done on light-gage metal strips that are passed into and thru cold-roll forming machines designed for the purpose. Such machines often have a considerable number of so-called roller stands.

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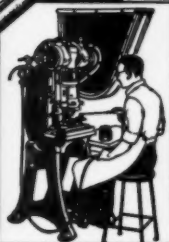
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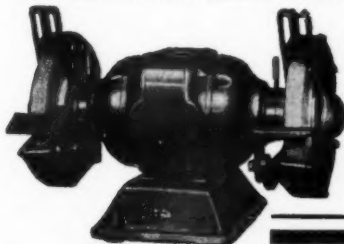
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AT RIGHT: Special Carbide Tool Grinder for accurately and quickly sharpening carbide tools; sturdy 1/2 hp., ball-bearing, reversible motor. 6" Silicon carbide wheels; adjustable tool-rest tables. Complete as shown.....\$95.00

BELOW: BALDOR GRINDER No. 800; 1/2 hp., ball-bearing motor, 1700 rpm., 110 volts, 60 cy., 8" x 1" Alloxite wheels. Enclosed guards and adjustable tool-rests.....\$54.00



— built for long,
heavy-duty service



Ask for Bulletins 305-A & 319

BALDOR ELECTRIC COMPANY
4368 Duncan Ave., St. Louis 10, Mo.

GRAVITY FEED OILING . . . with



NEEDLE VALVE ADJUSTMENT and SHUT-OFF

Available in several models, and with either glass or unbreakable reservoir, the Gits sight Gravity Feed Oilier permits flow of oil to bearing to be varied as desired by the simple turning of a knurled screw—or completely shut off during idle machine periods. These oilers are particularly adapted to applications of excessive vibration. The styles equipped with unbreakable reservoirs are widely used in the food processing and similar industries. Range of sizes, models and prices furnished on request.

Do you have a copy of the Gits Catalog No. 60?—write for it.

GITS BROS. MFG. CO.

1860 South Kilbourn Avenue ••• Chicago 23, Illinois

Exclusive for over 35 years

PROTRACTORS

Convenient measurement of angles and bevels, or their convenient layout, is important in any shop. The equipment used for the purpose will vary. While protractors are for the most part standard, some few have been developed for special purposes from time to time.

One special protractor has been made, for instance, which is provided with a vee-edged contact blade. It has been especially devised for measuring deviations from 90 degrees or square. Such have been much used for checking the perpendicular alignment of motor cyl-

inders, when they are being re-conditioned.

In ordinary cases on the drafting board, where a drafting machine of standard type is in use, angles of any given value can be laid down either from the horizontal or vertical position as a basis. But if an angle is to be laid out that has neither side horizontal or vertical, some computation is necessary.

In cases where there are many and varying angles to be dealt with, special draftsmen's protractors are used to greater advantage. Such protractors are especially useful where angles of given value are to be transferred from one drawing to another, or from one place to another on the same drawing.

Some of these tools are equipped with verniers, which read to five minutes. This tool provides a quick and easy method

of dividing circles on the drawing board.

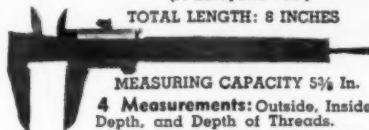
Bevel protractors much used in the shop often utilize an adjustable rule of the same kind that is used in connection with combination squares. This rule passes thru a revolving turret which is carefully graduated in degrees. This turret is made to swing within the protractor head, so that any desired angle may be readily obtained.

Such tools are made by different firms. One has devised a protractor head that extends on both sides of the rule or blade, which is slotted or kerfed to allow the rule to swing thru the head.

The Bendix Vernier Caliper

(A Lafayette Tool)

TOTAL LENGTH: 8 INCHES



MEASURING CAPACITY 5 1/4 In.

4 Measurements: Outside, Inside, Depth, and Depth of Threads.

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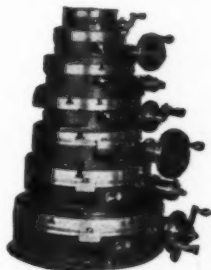
1/16 with Vernier: 1/128 in.
.025 in. with Vernier: 1/1000 in.

Net Price \$10.75

HARDENED MODEL

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Sizes 9", 12", 15" and 18".

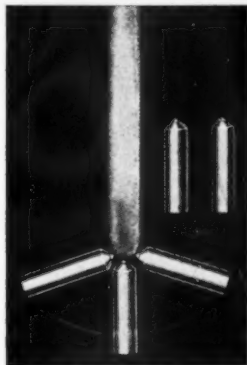
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The Chisel Point Diamonds for Radius Dressing out-wear pin point diamonds \$0 to 1. As illustrated above in 3/8 holder. Price \$6.00. Send for Booklet B.B.

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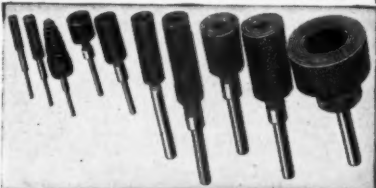
220 VIRGINIA STREET

HILLSIDE, N.J.

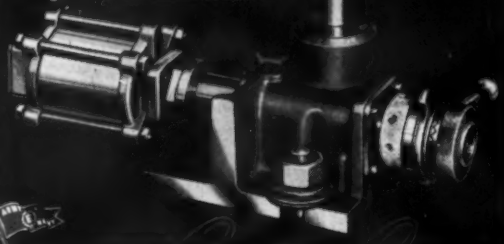
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A UNIVERSALLY useful tool that speeds up production or assembly lines. Synchronized air valve operates Chuck automatically, leaving both hands free for work. "Complete circle" grip... no danger of marring highly polished surfaces. Easily converted from air to hand operation or vice versa. Write for bulletin today!

THE WAYNE PUMP CO.
FORT WAYNE 4, INDIANA



Interchangeable Blank Collet Jaws. Keep a supply in the bin and drill to fit each job.

Distr. by The Bellows Co., Akron 15, Ohio, U. S. A.

STEEL STAMPS

The use of steel stamps of high quality is being appreciated more and more by those who have use for them. When the top end of a steel stamping tool begins to mushroom under repeated blows with a hammer, it is necessary to do one of two things in the interests of safety.

One of these is to take the tool to a grinding wheel, grind the mushroomed portion of steel away, and dress the tool back to its original shape. The other, is to discard it entirely in favor of a tool that will not mushroom. For there are steel stamps that will not spall nor mush-

room. Both letter and figure sets, as well as name and symbol stamps, may be had from one firm.

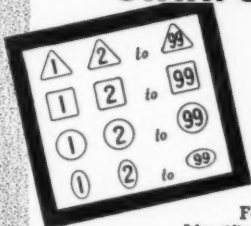
Really, the main proposition involved in the making of steel stamps that will stand up to the work for long periods, is that of using a steel that is thoroughly suited for such work. There are so many tool steels of so many analyses, available today, that one must be very careful in the selection of steels that are best suited to his particular work. One manufacturer of special tool steels, produces two different steels that are well suited for the manufacture of steel stamps.

Steel stamps and dies for marking and embossing of leather, plastics and wood, as well as metals, are made by some firms which have long specialized in such work. These include machine stamps and hammer stamps, as well as the ordinary designs of hand stamps. In addition

so alphabet and figure stamps, stamping type and type holders are provided, so that various number and letter combinations can be assembled into a steel stamp, as the occasion may require.

One firm in the steel stamp field, provides safe head, tough-faced steel stamps of hand type, in letters, figures or symbols, as may be desired. These people have been particularly successful in fitting such tools to the war effort. It is claimed, 90% of all stamping, including armor plate, required in production of war materials, can be done with stamps of their manufacture.

New STEEL INSPECTOR'S STAMPS



Faster
Identification
of Inspectors or Operators.
Different borders may be used
for different shifts. Available
in 4 sizes. Write for prices
today.

NEW METHOD STEEL STAMPS, Inc.
147 JOE CAMPBELL — BRIGHT T. O. A.



Now . . . A Heavy-duty Bench-type Engraving and Marking Machine . . The PANTO Model UE-3

- HEAVIER CUTTING SPINDLE
- FOUR SPINDLE SPEEDS
- MORE PANTOGRAPH REDUCTIONS
- FORMING GUIDE ATTACHMENT

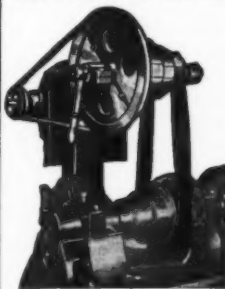
Plus the exclusive Panto feature . . . Inter-
changeable heads for engraving, electrical
marking, and acid etching.

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Showing Reynolds
No. 1-S attached to
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Designed to promote
peak performance in
machines using a
coolant (cutting or
soluble oils), Rey-
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are the answer to de-
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CRITERION *Boring Heads*

Original Accuracy *Maintained*

Lead
Screw
ground from
Solid AFTER
hardening.



Noted for maintaining original accuracy over a longer period Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

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BEVERLY HILLS, CALIFORNIA

AIR VALVES

Valves for the control of compressed air are always interesting, regardless of the particular application. One type that has been developed for use with compressed air hose, operates just as tho there were an air gun on the end of the hose, simply by flexing or bending the end of the hose. There is a nozzle-type fitting, which has a valve seat arranged inside, and a special valve disc carrying a stem. To the valve disc stem is attached, with a ball and socket joint, a lever of rod type which extends back into the hose. When this lever is deflected, thru

flexing end of the hose, it operates thru the ball and socket joint to pull the valve disc off of its seat, by tilting it against the resistance of a contained compression spring, thus releasing a blast of air. When the end of the hose is allowed to straighten, the compression spring, together with the force of the air behind the disc, acts to re-seat the valve disc tightly.

In addition to valve combinations of this kind for permanent attachment to the end of a hose, there are also models which are already assembled in a short length of hose, and fitted with a standard pipe fitting.

It is usually the case, when air control valves (as used for governing the flow of air to pneumatic cylinders) are wanted, that the same manufacturer making the valves will also

be found supplying air cylinders.

Also, it is very often true that the air valves and cylinders will work together to better advantage when both are made by the same firm.

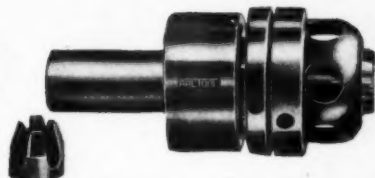
One company produces a line of valves incorporating a flat, cored-disc principle, that can also be used for fluid or hydraulic control, as well as air. While these are excellent valves in their own right, they are said to be at their best when teamed up with cylinders made by the same company.

There are some firms, however, that absolutely limit production to air valves.

New and Improved SELF RELEASING DIE HOLDER

The **ARCTOOL** self-releasing die holder is a precision built tool designed for use on screw machines, turret and engine lathes.

Severely tested under hard usage the **ARCTOOL** precision ground Self-Releasing Die Holder has proven its ability to stand up under gruelling conditions. Its simple, rugged construction permits rapid adjustment with a minimum of set-up time loss.



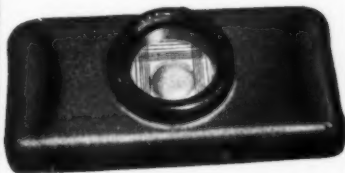
Its floating design automatically compensates for misalignment of the work, thus assuring accurately centered threads of uniform size.

No. of Die Holder	Diameter of Shank	No. of Acorn Die	Cutting Size Range	O. D. of Round Die	Cutting Size Range		Price
					Inches	Gage	
1	5/8 & 3/4	1	1/16—1/4	13/16	1/16—5/16	0—14	\$17.00
2	5/8 & 3/4	2	1/4—7/16	1"	1/8—7/16	6—14	\$20.00
3	3/4 & 1"	3	3/8—11/16	1-1/2	1/4—5/8	—*	\$23.00

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FELL PRECISION LEVEL



A precision "all-way" level for use in machine tool building, setting up and maintenance, whether for establishment of level working surfaces or for the accurate checking of straightness where true level itself is not required.

Graduations are in .0005" per foot and form squares about a circular bubble, thus giving coordinate readings and showing the direction and amount of slope, if any. Made in two sizes—5 1/4"x12"; 3 1/4"x6".

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bulletin giving full details.

Wm. B. FELL COMPANY
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SOCKET HEAD
CAP SCREWS



**SAFETY HOLLOW
SET SCREWS**

Try Them On Your Next Job!

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General Purpose. Holds the edge over H.S.S.

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Free Test Tools Promptly on Request

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CUTTING TOOLS

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SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

HYDRAULIC PUMPS

Various kinds of pumps are offered for hydraulic service. Many of these are suitable for use on hydraulically-operated machine tools, not to mention hydraulic presses of all kinds, plastic molding units and die-casting machines. A case may arise almost anywhere in machine design, where the operation of a ram or a plunger is a requisite, and where it can be actuated hydraulically to better advantage than deriving such a motion mechanically. This is especially true in cases where a considerable amount of power is desired in connection with such

applications include many different machine tool mechanisms and controls.

There are many hydraulic applications where the demand for oil pressure is intermittent. Such indicate the use of an hydraulic setup incorporating an accumulator. Instances include the operation of chucks, clamping units and various other devices of similar type. Using an accumulator, a pump smaller than would be required for taking care of the peak load can be utilized. During the time when it is not engaged in supplying a flow of oil to the mechanism proper, it is storing it in an accumulator.

a type of motion.

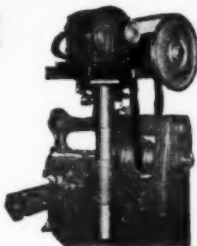
Rotary geared types of pumps are made by different firms. These have a considerable number of applications where compact units are desired, and where the capacity required is not large. These small pumps can be used for small-capacity hydraulic mechanisms, and have often been so applied with profit. As usually found, they vary in capacity from less than $\frac{1}{2}$ gallon per minute up to 3 gpm and providing pressures up to 400 pounds psi.

There are some specialists in the hydraulic pump field that have pumps available in literally hundreds of sizes and types. Pumps having pressures up to 1,000 psi can be had in capacities all the way from one to 120 gpm.

One firm has pumps available in the two-stage type which provide pressures up to 2,000 psi. Ap-

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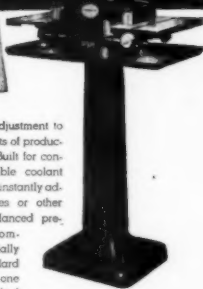


Save floor space, save power, and eliminate line shaft expense by installing MODERN MOTOR DRIVES in your plant. All drives are ball-bearing equipped and designed to fit practically every machine tool. Soundly engineered for long life.

**MODERN MOTOR DRIVES DIV.
NICHOLS ENGINEERING CO.
2400 W. MADISON ST., CHICAGO 12, ILL.**

The CRITERION Carbide Tool Grinder.

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PRODUCTION
CAPACITY**



Provides positive rapid adjustment to meet the rigid requirements of production tool manufacturing. Built for continuous service. Adjustable coolant system. Large work tables instantly adjustable without wrenches or other tools. One-third H.P. balanced precision bearing motor completely enclosed and radially mounted in rubber. Standard equipment. One 60 and one 100 grt 7" d.i.a. steel backed silicon carbide wheels. Ideal for metal bonded or Resinoid bonded diamond wheels.

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Precision type
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New Britain UNIVERSAL VISE THE ORIGINAL

Swivels 360 degrees horizontally,
100 degrees vertically, to
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NEW BRITAIN, CONN., U. S. A.**

ONLY ONE STOP COUNTER- SINK LIKE THIS



Schrillo maintains complete factory rebuilding service—assures a tool comparable to the original unit.



Send for complete information. Schrillo Aero Tool Engineering Co., 8715 Melrose Ave., Los Angeles 46, Calif.

MOTORS

Motor application problems are many and various. The fact that so many of them have been successfully met by electrical companies in the past emboldens the machine designer to incorporate elements in his design that he otherwise would not attempt.

Whatever the machines involved, or whatever conditions surrounding them, it seems, most of the leading electrical firms can incorporate the solution into a specially built motor, if there is no standard unit that will handle it.

Improvements in the electric motor field

go steadily on, regardless of the fact that for many years they have been in process of development. From time to time, as some new technique in mechanics is discovered, it is turned to advantage in the building of motors.

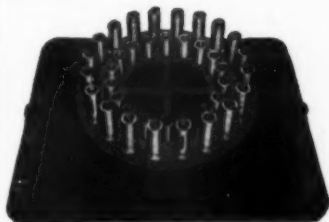
A case in point is found in the process of centrifugal casting. This technique was developed originally in connection with casting pipe, and used later on the casting of bearings. It has been applied to motor building by one prominent company, and they offer a one-piece rotor winding that is centrifugally cast of solid copper. Copper has excellent electrical, thermal and mechanical characteristics which make it superior for this use.

New synthetic-resin insulating varnishes are being used by large electrical firms for motors. These not only have exceptional bonding strength, preventing any movement of the windings, but also

have very high resistance to heat.

Incidentally, the new varnish drying method for motor armatures which is being used, traversing them on an overhead chain conveyor thru a drying tunnel made up of banks of infra-red lamps, is believed to be adding something to motor quality, as well as speeding the operation greatly.

One firm making motors with these new insulating varnishes, uses a rotor winding cast of aluminum. This is practically indestructible, and provides a motor with an exceptionally low-inertia rotor that is also electrically suitable.



Pictured: a 38-Spindle Heavy-Duty Drill Head.

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MULTIPLE DRILLING EQUIPMENT**

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MICHIGAN DRILL HEAD CO.
971 E. 8 MILE ROAD HAZEL PARK, MICH.

LUMA

Combination
Etchtool —
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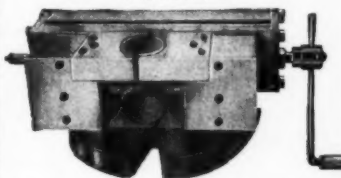
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Over-Running Clutch

A Free Wheeling Clutch of simple design recognized for many years as Standard Equipment for Automatic Dual Drive Operation—Automatic over-shoot at 2 speed drive—As a ratchet permitting infinite adjustment and as an automatic backstop. Furnished in a number of types.

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Being full particulars of your requirements. Notice a free reply will tell you how to obtain this clutch to your needs.

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★ CENTRIFUGAL SINGLE REVOLUTION FRICTION ★



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Speed your output with Criterion Diamond Tools. The kind of service they give is responsible for the swift, steady increase in their use. Quality of diamonds employed plus a unique method of setting assure extreme rigidity and extra tool life. Special tools made to order following blueprints or specifications. Sharp-pointed, selected thread grinding tools. Ask your dealer or order direct. Request free literature.

CRITERION MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

PEDESTAL GRINDERS

Much used for small and odd-job grinding, the pedestal grinder is frequently used as a tool sharpening machine. In some places it is used for light snagging. It can readily serve as a standby machine when the heavy floor-type snaggers are overloaded with work, so care should always be taken to route the very lightest of this work to the pedestal grinder. It is not built with the ruggedness and the stamina required to take the abuse incidental to heavy snagging.

Much work that once was considered as belonging to the pedestal grinder has

adjustable to wheel wear.

One manufacturer of a wide line of grinders offers pedestal grinders fitted with attachments for the grinding of drills.

Another firm has a pedestal machine that is fitted with safety eye shields, made of shatter proof glass, so that the eyes of the operator are relatively safe, even tho he may have forgotten or neglected to put on his goggles. Admittedly, workmen do fail to put on their goggles from time to time, regardless of all the training they have had in this respect. The shields enforce safety.

been taken to other machines and equipment as the years have passed. The grinding of drills is one case in point. While the small shop may still tolerate the grinding of drills freehand at the pedestal grinder, the larger and more progressive shops with many drills to grind generally have drill grinders installed to take care of this duty.

Some grinder manufacturers still make pedestal grinders in very heavy models. One recently noted is driven by a 15 hp motor, and it is made by a firm with long experience in this kind of machine building.

Other firms make rather full lines of lighter models, ranging from 3 hp to 5 hp. One company making such a line has equipped all of them with pushbutton safety starters, and safety hinge door guards, that are

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TRADE



MARK

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OFFSET

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Plain Type

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OPEN

CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

THREE-FOURTHS OFFSET.

**AUTO MOULDING
& MFG. CO.**

**2326 S. CANAL ST
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SPECIFICATIONS:
Open Width $\frac{1}{8}$ " to 6"
Gage Material .040 to .125
Pin Diameter .101 to $\frac{1}{16}$
Lengths to 120"

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WHITNEY-JENSEN PRODUCTS
30 YEARS EXPERIENCE

NEW! NO. 38 BENCH SHEAR

A small, powerful, throatless - type shear with capacity up to $\frac{3}{16}$ " mild steel. Cam action provides straight up-and-down blade travel. Length of blade 5". Size, overall, $11" \times 8\frac{3}{4}" \times 7\frac{1}{2}"$. Weight 45 lbs. All parts interchangeable for easy replacement.



WHITNEY METAL TOOL COMPANY
115 FORBES ST. • ROCKFORD, ILL.

**STANDARD
D-4
Abrasive
Band
Grinder**



This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. $4 \times 36\frac{1}{4}"$ band. The ideal portable unit.

OTHER STYLES AND SIZES IN NEW BOOKLET ON FINISHING—WRITE TODAY

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(Portable Elevating Table)

It's Easier to Push than to Carry

Load up to 20 tons on a PORTELVATOR . . . tools, materials, work in process, anything . . . save time, manpower and labor - cost. Write us.

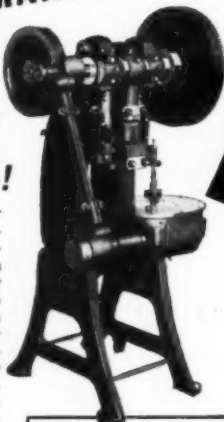
THE HAMILTON TOOL CO.
Ninth and Hanover Streets.
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Time and Money, Too!

Federal Dial Feed Presses are now being used for hundreds of time-saving, work-saving, money-saving operations in factories throughout the country—for their versatility is limited only by the tooling skill and resourcefulness of the production engineer. Easily indexed to any part of the crankshaft revolution, giving long or short dwell of dial. Positive-locking mechanism smooths out dial action, permitting unusually high speeds. Cannot skip or coast by stations. Available in eight sizes. Write today for new catalog which illustrates and describes complete line of Federal Presses.



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**FEDERAL
DIAL FEED
PRESSES**

SPECIAL SCREW MACHINE RODS

Under the stress of wartime conditions, countless changes have been made which were particularly dictated by the need of given types of material for specific purposes. In the case of screw machine rods, there were many items of peacetime consumption for which brass rod was used, for instance, which later went over to steel. When conditions permit, it is very likely that brass again will be considered for the making of many items for which it is not now available.

There are many factors offsetting the higher cost of brass rod as a screw machine material, which allow it to compete

very favorably with steel as touching the final cost of screw machine products. One of these is the higher rate of speed with which free cutting brass stock can be machined.

Another is the salvage value of the brass scrap or turnings, which is naturally quite high. Instances have been cited where these two factors alone were considered sufficient to offset the added cost of using brass rods.

There are other factors in favor of brass strictly from an economy standpoint, however. The material offers so much less resistance to the cut that complicated cuts often can be made in brass that would be next to impossible in steel. It is well known that a narrower cutoff tool can be used for brass rods than for steel, which means a definite lineal saving.

Tool life as touching the two different materials, in many cases, shows three to eight times

the length of service in favor of brass. Because tool wear is definitely less, accuracy is held for a much greater length of time on a given setup before it is impaired by tool wear. Thus, adjustment and grinding time are both saved. Many times, special extruded and cold drawn brass shapes, such as pinion gears, cam forms, etc., can be used advantageously for screw machine products.

Bronze rods, while they do not machine quite so easily as brass, do cut far more easily than steel, and are available from different sources. There is some leaded bronze, that has been machined with tungsten carbide tools, at 1500 surface fpm.

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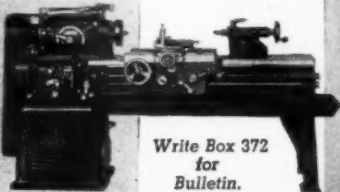
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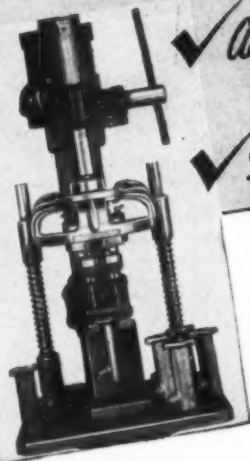
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CENTER PUNCHES

In the selection of a steel for the making of center punches, one often favored is stocked in the 1% to 1.10% carbon range. Used for this purpose, the steel is hardened by quenching in water or 10% brine at 1380 to 1425 degrees F. It is then tempered or drawn between 450 and 525 degrees F.

Another steel made by the same firm, found very suitable for center punches, contains carbon from .90 to 1%, and has a vanadium content of from .20 to .30%. The vanadium insures a fine grain size, lending additional strength and toughness

to the steel. There is also a non-tempering steel made by another company that is excellent for center punches. This material is hardened by heating it to any color between bright red and lemon, which equals a heat range of 1550 to 1825 degrees F and quenching it in water, after which it is ready for use directly.

Machinists center punches as made by various companies, come in sets, tho they may also be had singly. The diameter given as a center punch size is at the top of the tapered or "business" point.

Not all makers are agreed on proportions, or on the number of punches in a set. One manufacturer, for instance, makes these punches in sets of six, varying in diameter from 1/16 to 1/4", and the punches become progressively shorter as they reduce in diameter.

Another maker of small tools provides a set of five punches

instead of six, the smallest diameter being 1/16 and the largest 7/32". These punches are all of substantially the same length. Still another firm makes a set of four center punches, with diameters varying from 5/64 to 5/32", all 4" in length, and then provides one extra heavy punch in addition, 5" long, and of 1/4" diameter. These are all very good punches, and it is largely a matter of individual preference as to which type a man will use, or else it is a matter of what he has become accustomed to using.

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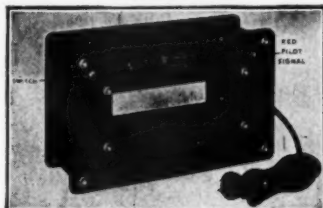
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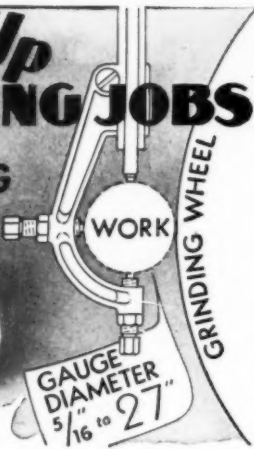
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ANVILS

When those of us who are 40 years old or more hear an anvil mentioned, it is very likely to remind us of the old blacksmith shop. It is possible that even today, there are more blacksmith's anvils in use than any other kind, but we need to bear in mind that there are other kinds of anvils.

Tool makers' anvils, chain makers' anvils, and saw makers' anvils carry more than ordinary interest, in addition to the better known blacksmith's anvils. Some firms make all four types of anvils. One of these fits his anvils with tool steel faces.

in addition is recommended as an anvil facing material.

Often there are times around the shop when an anvil is needed for some light bit of work, where it is not feasible to have a standard anvil of any kind on hand. With this in mind, one manufacturer of a line of machinists' tools has combined the function of a light shop anvil with a handy V-block of special design. The smooth surfaces of the block make it adaptable for an anvil that can be laid on the bench. In addition, it has holes drilled thru it at judicious locations, so that drifts can project thru work.

This is a method of manufacture that has been much used, for it permits making the faces of the anvils quite hard, and yet retaining a great deal of toughness in the anvil proper. At the same time, the cost is considerably reduced as against the proposition of making the anvils from solid blocks of tool steel.

However, there are those who prefer to have anvils made of the same material thruout, and there are manufacturers making them that way. One in particular makes anvils from solid blocks of Swedish charcoal tool steel. The steel which forms the working face of an anvil is naturally very important, and yet a highly expensive steel need not be used.

One manufacturer of tool steels has an inexpensive steel that is good for various kinds of blacksmith tools, and

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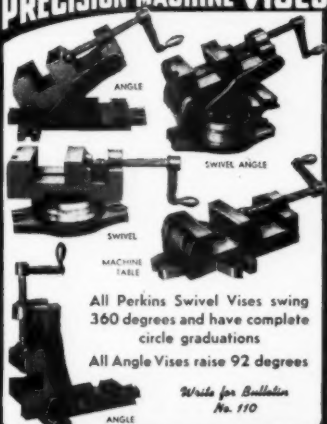


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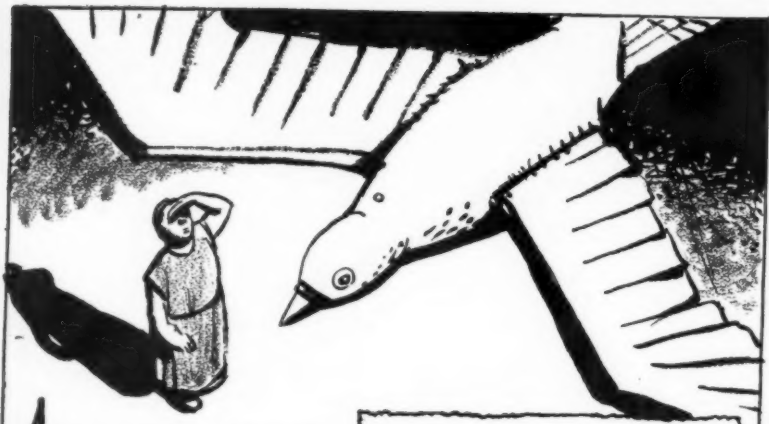
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Mechanics Through the Ages

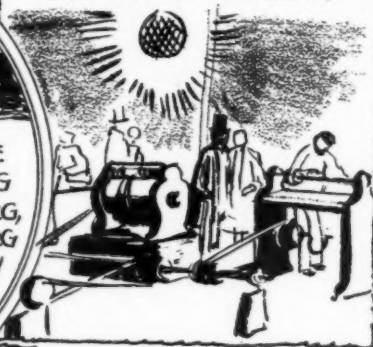


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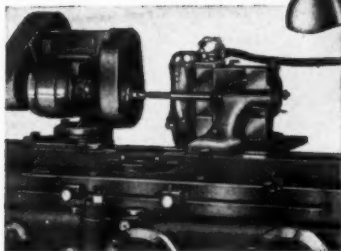


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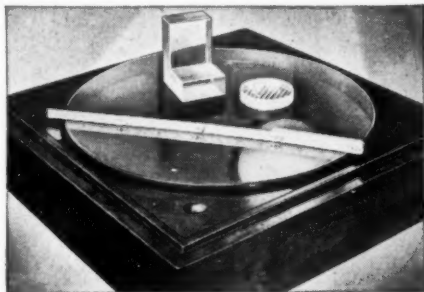
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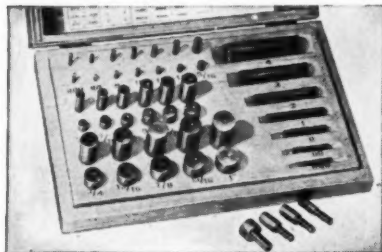
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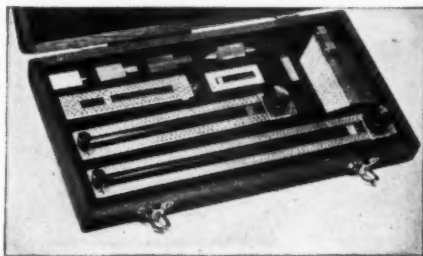
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1/8	3/8	3/8	3	2.20
5/32	3/8	3/8	3	2.20
3/16	3/8	1/2	3	2.20
7/32	3/8	5/8	3 1/8	2.20
1/4	3/8	5/8	3 1/8	2.20
9/32	3/8	3/4	3 1/8	2.20
5/16	3/8	3/4	3 1/8	2.20
11/32	3/8	3/4	3 1/4	2.20
3/8	3/8	3/4	3 1/4	2.20
7/16	1/2	1	4 1/4	2.80
1/2	1/2	1	4 1/4	2.80
5/8	5/8	1 3/8	5	3.44
3/4	3/4	1 5/8	5 5/8	4.20
1	1	1 3/4	6 1/4	5.40

SINGLE END
Two and Four Flutes

Dia. of Mill	Dia. of Shank	Length of Flutes	Overall Length	Net Price
1/8	3/8	3/8	2 5/16	1.40
3/16	3/8	1/2	2 3/8	1.40
1/4	3/8	5/8	2 1/2	1.40
5/16	3/8	3/4	2 1/2	1.40
3/8	3/8	3/4	2 1/2	1.40
7/16	1/2	1	2 1/16	1.76
1/2	1/2	1 1/4	3 1/4	1.88
5/8	5/8	1 5/8	3 3/4	2.40
3/4	3/4	1 5/8	3 3/4	2.52

LONG SINGLE
END MILLS

Four Fluted

Dia. of Mill	Dia. of Shank	Length of Flutes	Overall Length	Net Price
1/4	3/8	1 1/4	3 1/8	1.68
5/16	3/8	1 3/8	3 1/8	1.68
3/8	3/8	1 1/2	3 1/4	1.68
7/16	1/2	1 3/4	3 3/4	2.08
1/2	1/2	2	4	2.16
5/8	5/8	2 1/2	4 5/8	2.76
3/4	3/4	3	5 1/2	3.44

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Norgren Co., C. A.	221
Numberall Stamp & Tool Co.	150

Ohio Machine Tool Company	45
Oliver Instrument Co.	387
O'Neill-Irwin Manufacturing Co.	84
Onsrud Machine Works	392

Paddock Tool Co.	337
Parker Company, Chas.	339
Peerless Machine Co.	247
Pellow Machine Tool Co.	322
Phillips Manufacturing Co.	316
Pier Equipment Co.	382
Plan-O-Mill Corp.	171
Plunkett Machine Co., J. E.	228
Pope Machinery Corp.	95
Portage Machine Co.	343
Porter-Cable Machine Co.	23
Porter Machine Co.	300
Potter & Johnston Machine Co.	161
Pratt & Whitney	89
Precise Products Co.	378
Preis Eng'g, Mch. Co., H. F.	397
Procurier Safety Chuck Co.	19
Production Machine Co.	385
Production Mch. Develop. Co.	142
Product Machine Co.	348
Prosser & Son, Thomas	61
Putnam Tool Co.	292
Pyrometer Instrument Co.	372

Quality Tool & Die Co.	147
Quality Tool Works	288
Queen City Machine Tool Co.	292

R & L Tools	210
Racine Tool & Machine Co.	83
Reading Machine Co.	308
Recon Manufacturing Co.	342
Redner Air Devices Corp.	346
Remco Products Corp.	365
Reynolds Mch. Co.	397
Richards Co., J. A.	370
Richard-Shafer Company	68
Rieger Manufacturing Co.	340
Rivett Lathe & Grinder, Inc.	2
Robbins Eng. Co.	289
Rockford Drilling Machine Co.	325
Rockford Magnetic Products Co.	314
Rogers Machine Works	18
Rogers & Co., Sam'l. C.	140
Ross Co., David J.	240
Rotary File Co.	55
Rotor Tool Co.	117
Rouse & Co., H. B.	341
Rusnok Tool Works	306
Ruthman Machinery Co.	306
Ryerson & Son, Inc., Jos. T.	128

S & S Machine Works	389
San Angelo Foundry & Mch. Co.	156
Sav-Way Industries	215
Saw & Knife Specialty Co.	234
Schauer Machine Co.	246
Scherr Co., George	115
Schmidt Inc., Geo. T.	42
Schrillo Aero Tool Eng. Co.	402
Schultz & Anderson Co.	391-399
Sellstrom Mfg. Co.	282
Seneca Falls Machine Co.	169
Servance Tool Industries, Inc.	47
Shearcut Tool Co.	190-358
Sheffield Corp.	139
Sheldon Machine Co.	295
Shewek Tool Div. of Domestic Industries Inc.	91
Sigourney Tool Co.	386
Silbaw Inc.	124
Smalpeice, Ltd.	44
Smit & Sons, J. K.	148

Smith & Co., D. A.	296
Smith Tool & Eng. Co.	373
Somerset Industrial Diamond Co.	395
Sosner Tap & Tool Corp.	126
South Bend Lathe Works	317
Southwest Manufacturing Co.	126
Specialties Manufacturing Co.	307
Stackbin Corporation	347
Stadoll Manufacturing Co.	184
Standard Electrical Tool Co.	283
Standard Machinery Co.	187
Standard Transmission Eng. Co.	370
Steege Machinery Co., W. L.	397
Stokerup Corp.	153
Sturdimatic Tool Co.	23
Sturtevant Co., P. A.	25
Sundstrand Machine Tool Co.	133
Sunnen Products Co.	255
Sun Oil Co.	181
Swedish Gage Co. of America	335
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Syntron Company	298

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Tamm-Silica Company	389
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Therawell Tap & Die Co.	163
Trico Fuse Mfg. Co.	300
Triplex Machine Tool Corp.	387
Troyke, Alfred A.	395
Tungsten Electric Corp.	29
Turner Machine Co.	319

U. S. Hoffman Mch. Corp.	293
U. S. Mch. Tool Mfg. Corp.	188
U. S. Tool Company	259
Ullman Products Co.	188
Unique Manufacturing Co.	363
United Industries, Inc.	358
United Precision Products Co.	248
Universal Engineering Co.	136-216-230-242
Utility Tool & Die Mfrs.	88

Van Keuren Co.	207
Varl, Inc.	229
Victor Machinery Exchange	227
Vonnegut Moulder Corp.	337

Wade Instrument Co.	356-370
Wade Tool Co.	238
Walker-Turner Co.	16
Walla Sales Corporation	405
Wardwell Mfg. Co.	300
Wayne Pump Company	396
Weber Machine Corp.	353
Wellex, Inc.	152
Wells Manufacturing Corp.	177
Wesson Products Co.	96
Westcoast Diamond Tool Co.	275
Western Tool & Mfg. Co.	180
Westmore Reamer Company	165
Wetzler Clamp Company	360
Wheel Truening Tool Co.	48
White Dental Mfg. Co., S. S.	167
Whitney Metal Tool Co.	405
Wiedemann Machine Co.	290
Wieland's Carbide Tool Co.	531
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Wilson Mechanical Instrument Co.	411
Wittek Mfg. Co.	41
Woodworth Co., N. A.	21
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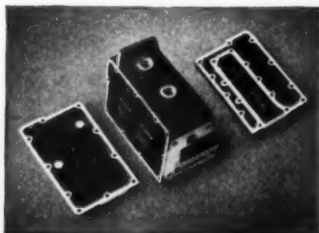
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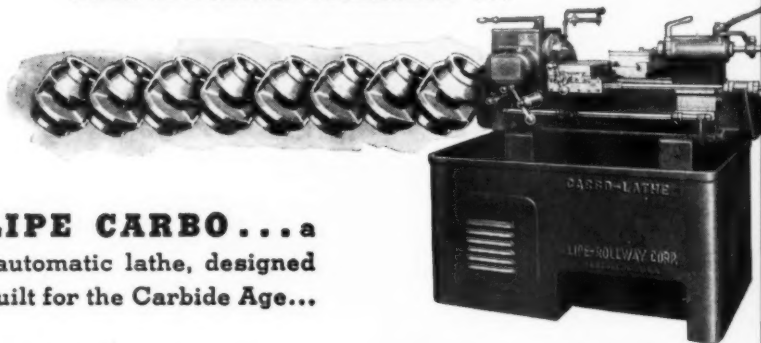
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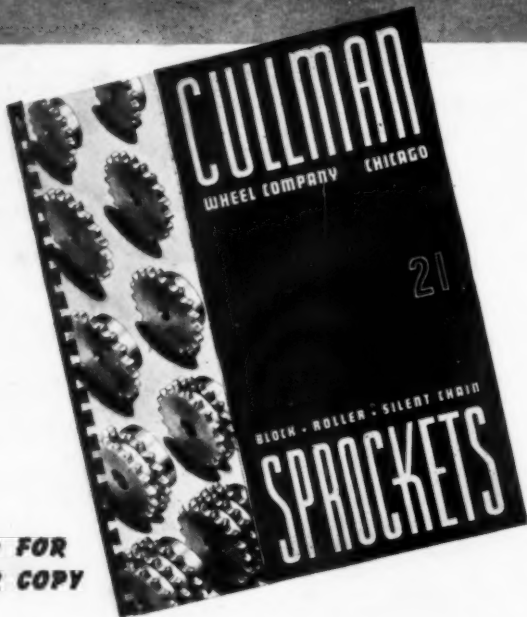
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